UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1 – NEW ENGLAND

IN THE MATTER OF Stavis Seafoods, Inc. 212 Northern Avenue, Suite 305 Boston, MA 02210 Proceeding under Section 113 of the Clean Air Act	**NOTICE OF VIOLATION AND ADMINISTRATIVE ORDER**

INTRODUCTION

1. The United States Environmental Protection Agency Region 1 ("EPA") issues this Notice of Violation and Administrative Order ("NOV/AO") to Stavis Seafoods, Inc. ("Respondent") for Respondent's failure to comply with Section 112(r)(1) of the Clean Air Act ("CAA"), 42 U.S.C. § 7412(r)(1), in the handling of anhydrous ammonia at Respondent's frozen and fresh seafood processing facility in Boston, Massachusetts.

2. The AO is issued under the authority of Section 113 of the CAA, 42 U.S.C. § 7413. Section 113(a)(3) of the CAA, 42 U.S.C. § 7413(a)(3), provides that EPA may issue an order requiring compliance with the requirements or prohibitions of Subchapter I of the CAA (which include, among other things, the requirements of Section 112(r), 42 U.S.C. § 7412(r)).

3. Respondent will have a formal opportunity to discuss the final NOV/AO as set forth in Paragraph 53 below.

STATUTORY AND REGULATORY AUTHORITY

4. Pursuant to Section 112(r)(1) of the CAA, 42 U.S.C. § 7412(r)(1), owners and operators of stationary sources producing, processing, handling, or storing substances listed

pursuant to Section 112(r)(3) of the CAA, 42 U.S.C. § 7412(r)(3), or any other extremely hazardous substance, have a general duty, in the same manner and to the same extent as 29 U.S.C. § 654, to (a) identify hazards which may result from accidental releases of such substances using appropriate hazard assessment techniques; (b) design and maintain a safe facility taking such steps as are necessary to prevent releases; and (c) minimize the consequences of accidental releases which do occur. This section of the CAA is referred to as the "General Duty Clause."

5. The extremely hazardous substances listed pursuant to Section 112(r)(3) include, among others, anhydrous ammonia.

6. The term "accidental release" is defined by Section 112(r)(2)(A) of the CAA, 42 U.S.C. § 7412(r)(2)(A), as an unanticipated emission of a regulated substance or other extremely hazardous substance into the ambient air from a stationary source.

7. The term "have a general duty in the same manner and to the same extent as section 654, title 29 of the United States code" means owners and operators must comply with the General Duty Clause in the same manner and to the same extent as employers must comply with the Occupational Safety Health Act administered by the U.S. Occupational Safety and Health Administration ("OSHA").[1]

---

[1] Section 654 of OSHA provides, in pertinent part, that "[e]ach employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees" and "shall comply with occupational safety and health standards promulgated under [OSHA]." 29 U.S.C. § 654. *See* Durion Company, Inc. v. Secretary of Labor, 750 F.2d 28 (6th Cir. 1984). According to the legislative history of the CAA general duty clause, Durion is cited as a guide for EPA's application of the general duty clause. Durion criteria are those established earlier in National Realty & Construction Co. v. OSHRC, 489 F.2d 1257 (D.C. Cir. 1973), namely, that OSHA must prove (1) the employer failed to render the workplace free of a hazard; (2) the hazard was recognized either by the cited employer or generally within the employers' industry; (3) the hazard was causing or was likely to cause death or serious physical harm; and (4) there was a feasible means by which the employer could have eliminated or materially reduced the hazard.

For purposes of complying with the CAA general duty clause, owners and operators must maintain a facility that is free of a hazard, the hazard must be recognized by the owner/operator or recognized by the owner/operator's

8. Section 113(a)(3) of the CAA, 42 U.S.C. § 7413(a)(3), authorizes EPA to issue compliance orders for violations of the Act, including violations of Section 112(r), 42 U.S.C. § 7412(r). A copy of the order must be sent to the relevant State air pollution control agency. An order relating to a violation of Section 112 of the CAA can take effect immediately upon issuance.

GENERAL ALLEGATIONS

9. Respondent Stavis Seafoods, Inc. operates a processing and distribution facility for fresh and frozen seafood products located at 7 Channel Street, Boston, MA (the "Facility").

10. The Facility is located near the Marine Industrial Park area in Boston's Seaport District, which is a mixed-use section of the waterfront in Boston, Massachusetts within close proximity to commercial buildings, residences, hotels, bars, restaurants, and an outdoor entertainment facility.

11. Respondent is a corporation incorporated in Massachusetts and is a "person" within the meaning of Section 302(e), against whom an Administrative Order may be issued under Section 113(a)(3) of the CAA, 42 U.S.C. § 7413(a)(3).

12. The Facility is a "stationary source" as that term is defined at Section 112(r)(2)(C) of the CAA, 42 U.S.C. § 7412(r)(2)(C).

13. The Facility has a refrigeration process that cycles anhydrous ammonia through gas and liquid physical states to provide refrigeration for the freezing of incoming fresh seafood and for the storage of fresh and frozen products. According to information provided by Respondent's representatives to EPA, at the time of the violations alleged herein, the Facility

---

industry, the hazard from an accidental release must be likely to cause harm, and the owner/operator must be able to eliminate or reduce the hazard. U.S. EPA, *Guidance for Implementation of the General Duty Clause Clean Air Act Section 112(r)(1)* (May 2000) at 11, footnote 4.

used a total amount of 5,400 pounds of anhydrous ammonia in its refrigeration system, although EPA calculated a higher amount of about 7,000 pounds. Accordingly, Respondent "stores" and "handles" anhydrous ammonia, which, as indicated in Paragraph 5 above, is an "extremely hazardous substance" subject to the General Duty Clause.

14. At atmospheric temperature and pressure conditions, anhydrous ammonia is a clear, colorless gas with a strong odor. It is often stored and shipped under pressure as a liquid. It presents a significant health hazard because it is corrosive to the skin, eyes, and lungs. Ammonia vapors may be fatal if inhaled. Exposure to 300 parts per million by volume is immediately dangerous to life and health. Ammonia gas is generally regarded as nonflammable but does burn at concentrations of approximately 15.5% to 27% by volume in air with strong ignition. It can explode if released in an enclosed space with a source of ignition present or if a vessel containing anhydrous ammonia is exposed to fire. The fire hazard increases in the presence of oil or other combustible materials. At the time of the violations alleged herein, a worst-case release of ammonia could have seriously injured thousands of people in the proximity of the Facility.

15. Due to the dangers associated with anhydrous ammonia, the ammonia refrigeration industry has developed industry standards to control the risks associated with the use of ammonia. In collaboration with the American National Standards Institute, the International Institute of Ammonia Refrigeration ("IIAR") has issued (and updates) "Standard 2: Equipment, Design, and Installation of Closed-Circuit Ammonia Mechanical Refrigerating Systems," along with other applicable standards and guidance. Bulletins and guidance include without limitation: IIAR Bulletin No. 109, *Guidelines for IIAR Minimum Safety Criteria for a Safe Ammonia Refrigeration System* (1997); IIAR Bulletin No. 110, *Guidelines for Start-Up,*

Inspection, and Maintenance of Ammonia Mechanical Refrigerating Systems (rev. 2002); IIAR Bulletin No. 114, *Guidelines for Identification of Ammonia Refrigeration Piping and System Components* (1991 and 2014 editions); IIAR Bulletin 116, *Guidelines for Avoiding Component Failure in Industrial Refrigeration Systems Caused by Abnormal Pressure or Shock* (1992); and the 2005 *Ammonia Refrigeration Management Program* ("IIAR ARM Program"), which is intended for systems containing less than 10,000 pounds of ammonia. Also in collaboration with the American National Standards Institute, the American Society of Heating, Refrigerating and Air-Conditioning Engineers has issued (and updates) "Standard 15: Safety Standard for Refrigeration Systems." These standards are consistently relied upon by refrigeration experts and are sometimes incorporated by reference into state building, mechanical, and fire codes.

16. On March 23, 2016, at least 2,100 pounds of anhydrous ammonia was released at the Facility from a broken pipe and valve from the pilot high pressure receiver in the Facility's ammonia machinery room (the "Release"). An ongoing ammonia release ensued which resulted in the death of the Facilities Manager who was responsible for the Facility's ammonia refrigeration system. The local fire department and police responded to the Release. The Release continued for several hours during which time the emergency responders could not turn off the leaking vessel due to high concentrations of ammonia and the lack of an easily identifiable and accessible shut-off valve ("king valve") for the vessel. Respondent has not operated the System since the Release.

17. On March 24, 2016, a duly authorized EPA inspector and two of EPA's Senior Environmental Employment ("SEE") Program grantees conducted an inspection ("the March 24, 2016 Inspection") at the Facility alongside representatives of the Boston Fire Department, the Occupational Safety and Health Administration ("OSHA"), Massachusetts Department of Public

Safety, Massachusetts Department of Public Health, Massachusetts Environmental Police representing the Massachusetts Attorney General's Office, Respondent's management, and Respondent's supporting contractor, American Refrigeration Company. The purposes of EPA's March 24, 2016 Inspection were to investigate the Release and determine whether Respondent was complying with Section 112(r) of the CAA, the Emergency and Community Right-to-Know Act ("EPCRA"), and the Comprehensive Environmental Response, Compensation, and Liability Act's ("CERCLA") release notification procedures. The March 24, 2016 Inspection consisted of a walk around the Facility exterior and inside the Facility's first flood maintenance storage area and the second floor ammonia machinery room area located on the Massport Haul Road and alleyway corner of the Facility.

18. The Facility's ammonia refrigeration system ("the System") had several components typically found in such systems, some of which are described below. Some components dated from 1984, and the System was subsequently enlarged and modified several times, as recently as 2016.

a. ***Evaporators:*** These are the units in which the ammonia is allowed to evaporate (at a low -28° F boiling point), drawing and absorbing the heat from a room as the ammonia evaporates, thereby cooling a room. This Facility had several cooling areas, including Cooler A (Fish Cutting Room) and Cooler B (Jack Room). Ammonia pipes ran from these rooms to the ammonia machinery room. The Facility had a total of sixteen evaporators.

b. ***Compressors:*** After being allowed to evaporate, ammonia gas flows at low pressure to a compressor where it is compressed to a higher pressure. This compression process also raises the temperature of the gas. The hot, compressed

vapor is then in a thermodynamic state known as a superheated vapor and is at a temperature and pressure at which it will next be condensed with either cooling water or cooling air. Oil is used in the compressor to help seal it and lubricate the compressor's parts. Used oil must be regularly removed from the compressor. This Facility had five compressors.

c. ***Accumulator:*** An accumulator is a temporary reservoir that prevents liquid refrigerant and oil from entering the compressor because compressors are designed to compress only ammonia that is a gaseous (vapor) state. This Facility had at least two accumulators, including a low temperature accumulator and a high temperature accumulator.

d. ***Condenser:*** Heated ammonia vapor at high pressure flows from a compressor to the condenser, where the vapor flows through the condenser's heat exchanger. The heat exchanger cools the vapor and condenses it into a liquid. From here, the liquid typically flows at high pressure into a high pressure receiver, where it is stored. Respondent's condenser was located on the roof.

e. ***High Pressure Receivers:*** High pressure receivers are tanks that have the function of (a) collecting ammonia after the condensing stage, (b) storing most of the ammonia in a typical refrigeration system, and (c) sending the ammonia out to the evaporators. Due to their capacity to release large amounts of ammonia if breached, it is important to maintain the integrity of the receivers and associated valves. Respondent's System had two high pressure receivers located in the Facility's ammonia machinery room, including a Pilot Receiver and a Control Pressure Receiver, both of which were built in 1984. Other pressure vessels in

this System include the accumulators, the transfer (dump) tank, and oil separator vessels.

f. ***Pumps and valves***: Like most ammonia refrigeration systems, the System has multiple pumps and valves to move and control the flow of ammonia through the System. Receivers have "king valves" that can be used to stop the flow of ammonia from the receivers to the rest of the System during an emergency. Closing the king valve will essentially turn off an ammonia system, thus shortening the duration of any continuing ammonia releases. Often, but not at this Facility, solenoid valves near these king valves can be activated by emergency switches outside the building so that emergency responders do not have to enter a building filled with ammonia vapors to turn off a system. The Facility's high pressure receivers had king valves, but these valves were not labelled appropriately, and the king valve for the Control Pressure Receiver was not easily accessible.

g. ***Piping:*** Pipes throughout the Facility and on the roof carry ammonia in all its various physical states.

h. ***Ammonia detectors:*** These devices, typically placed in ammonia machinery rooms, detect ammonia vapors that have been released at certain concentrations. They activate alarms to warn employees and emergency responders of a release, and they activate ventilation systems to prevent vapors from building up to dangerous levels. It is essential for detectors to be properly placed, maintained, calibrated, and connected to alarms and ventilation systems so that they can fulfill their function. The Facility had an ammonia detector in the

ammonia machinery room, but the link between this detector and the alarm, ventilation system, and automatic equipment shutdown was disabled prior to the Release. Also, the Facility did not have an audible alarm system.

i. ***Emergency controls***: An emergency control box, typically placed outside the designated machinery room door, allows emergency responders to control releases by actuating key refrigeration system equipment, such as compressors, ventilation, and king valves. The Facility had an emergency control box located on the first floor outside the maintenance/ammonia machinery room building, while the ammonia machinery room was located on the second floor of that building.

j. ***Computerized Control System***: Some facilities, such as this one, have computerized control systems that help monitor and control the ammonia refrigeration system. This Facility's computerized control system is hereinafter referred to as the M&M Control System.

19. During the March 24, 2016 Inspection, the EPA Inspectors observed some potentially dangerous conditions relating to the System. Due to the seriousness of the Release, EPA hired an ammonia refrigeration expert ("Expert") with over 30 years of experience to review the condition of the System. The Expert, an EPA inspector, and an additional EPA contractor inspected the Facility again on April 6, 2016 ("the April 6, 2016 Inspection").

20. The potentially dangerous conditions that EPA observed during the March 24, 2016 and April 6, 2016 inspections are listed in the chart attached hereto as Attachment 1, which is incorporated by reference into this NOV/AO. Some of the conditions include the following:

a. It is questionable whether some pieces of equipment and piping are fit for service and thus require testing before reuse. For example, several pressure

vessels do not have a "U" or "UM" stamp, are not listed by an approved nationally recognized testing lab, or are not otherwise documented as meeting the design, fabrication, and testing requirements of the ASME Boiler and Pressure Vessel Code. Also, the nameplate on the transfer ("dump") tank is missing. Likewise, some vessels and piping are covered with failing or deficient vapor barriers, so it is unclear whether they have been protected from moisture and corrosion sufficiently to be fit for continued use.

b. The oil separator pressure vessels have no pressure relief protection to prevent catastrophic blow outs in the event of fire or other incidents. Existing pressure relief valves on other pressure vessels in the system are not tagged to indicate the date of installation or date of last inspection.

c. Areas in the facility containing significant quantities of ammonia, including the ammonia machinery room ("AMR"), do not have an audio and visual alarm system to warn personnel in the event of an ammonia release. Although there appears to be a visual alarm light outside the primary entrance to the AMR building, it is not adequately labeled to identify its purpose.

d. The layout of the AMR does not provide safe access to equipment. The space is very cramped and lacks clear, unobstructed spaces for inspection, service, maintenance, and emergency shutdown of equipment in many instances. There is inadequate lighting in the room. Also, there is only one means of egress, and it is across the room from the receivers and down a set of wooden stairs (which could be unusable in the event of a fire). Further, a set of doors on the second floor opens to the exterior of the building, but no landing or stairs down are provided. This could present a major danger to workers or emergency responders attempting to rapidly exit the area during an emergency.

e. Ammonia piping, valves, and other system components are not adequately safeguarded to protect from accidental damage or rupture by external sources. For example, multiple oil drain lines on pressure vessels extended from the tanks into walkways and were not protected from potential impact.

f. The AMR, located on the second floor, is not properly isolated from the first floor maintenance room. The doors into the AMR are not tight-fitting and self-closing, and the AMR walls contain holes and gaps for piping and conduit that are not sealed from other spaces in the building.

g. The only door entering the AMR building lacks adequate labeling; it fails to warn of the hazards of entering a room with ammonia-containing machinery, restrict access to authorized personnel, provide appropriate information about alarms, and post emergency procedures.

h. There is no safe way to access ammonia-containing equipment on the roof or to leave the roof, which can only be accessed by an unsecured ladder placed

precariously near the wooden steps leading down to the first floor of the building. Also, the roof does not have guardrails installed or any other method of fall protection to protect personnel working near the roof edge.

i. Although an emergency ventilation system for the AMR is present, the air intake louvers in the AMR did not open during the March 23rd, 2016 Release. Also, the louvers do not appear to be of the type that use power to close and otherwise spring open because the louvers were closed during EPA's March 24, 2016 Inspection and during EPA's April 6, 2016 Inspection. In addition, the motor and louvers were not properly assembled together. Without adequate ventilation, ammonia vapors could build up to dangerous levels during a release. Also, the emergency ventilation exhaust discharge point is less than 20 feet from the property line, which could further endanger neighboring businesses and the general public in the event of a release.

j. The link between the AMR ammonia detector and the ventilation system and automatic equipment shutdown was manually bypassed/disabled prior to the Release. This means that, although the detectors registered high levels of ammonia, the M&M control system would not have automatically turned on the emergency ventilation, shut down the compressors, and activated the alarm. The M&M control system also appears to be improperly calibrated, as the time of day displayed is incorrect. Also, it appears that the ammonia detectors have not been calibrated since January 2015, even though the manufacturer recommends bump tests at least every six months and re-calibration at least annually.

k. The emergency shutdown valve on the Control Pressure Receiver is not accessible. Also, emergency shutdown valves for the system are not adequately labeled.

l. A significant amount of ammonia-containing piping and equipment in the AMR, on the roof, and in other areas is not adequately labeled to indicate the contents, pressure, physical state, and direction of flow. Also, most of the natural gas piping at the facility was not labeled, even though some were located right next to ammonia piping and in some instances were painted the same color as ammonia piping, which could confuse workers and emergency responders.

m. There is one locked remote control box for shutting down the equipment in the AMR and for starting a ventilation fan in the case of a release, but the switches do not have clearly marked signage about their function. The key to the remote control box was not easily accessible by emergency responders during the March 23rd release. Also, given that the control box is downstairs outside the entrance to the building and the AMR is on the second floor, people in the AMR would have difficulty accessing the controls in an emergency situation. Finally, the remote control for shutting down the

equipment does not appear to power off all equipment in the AMR, as an air compressor turned on during EPA's March 24th inspection.

n. The facility does not have proper eyewash/shower stations inside or immediately outside the AMR. There is an eyewash station (but no safety shower) at the bottom of the wooden stairs below the AMR, but it is not easily accessible by personnel working upstairs in the AMR. Also, it does not appear to be plumbed to an adequate water source.

o. There is excessive corrosion, ice buildup, and vapor barrier failure on some piping, valves, vessels, and other equipment in the system. Some vapor barriers were of a type that holds water and that can therefore cause corrosion.

p. There are multiple fire hazards and combustible items in the AMR building, including exposed electrical wiring, multiple combustible/flammable items stored in the first floor maintenance room, a wooden staircase, and an electrical conduit that was observed to be dripping water.

q. The facility does not have adequate documentation on site about the technology and equipment in the system. For example, the process and instrumentation diagram posted in the AMR does not include some key process equipment located in that room. Also, the Facility could not produce calculations to demonstrate that the pressure relief vent header or the AMR ventilation were adequate.

r. The facility has not conducted a hazard analysis/review to identify all of the hazards associated with the system.

21. During the April 6, 2016 Inspection, the Expert confirmed EPA's previous findings about the System and developed a list of proposed critical action items that EPA e-mailed to Respondent on June 21, 2016. The recommended critical action items to be undertaken prior to the restarting of the System by Respondent or any other person or entity, included the following:

a. Conduct non-destructive testing of ammonia refrigeration system piping and vessels. The testing should include ultrasonic testing or another equivalent test method to evaluate the fitness-for-service of each component on the system. Additionally, the nipple weld on the pilot receiver where the line break occurred should be penetrant tested.

b. Re-rate pressure vessels in ammonia refrigeration system, including the vessels listed below, or otherwise provide design and testing documentation

that the vessels are fit for service: (i) Pressure Control Receiver—RVS-83017; (ii) Pilot Receiver—RVS-83016; (iii) Transfer (Dump) Tank—RVS-83005; (iv) Low Temperature Accumulator—No RVS number; (v) Compressor Oil Separators; (vi) Oil pots.

c. Verify and certify that all small bore (2" diameter and less) anhydrous ammonia piping are Schedule 80.

d. Provide vessel relief calculations for all vessels including the icemakers.

e. Provide relief header calculations.

f. Provide ventilation calculations for the ammonia machinery room.

g. Replace the relief valves on the pilot receiver.

h. Pressure test (150 psig low side and 250 psig high side) the entire system prior to charging ammonia for 48 hours.

i. Vacuum test (1,000 microns) for 24 hours prior to charging ammonia.

j. Install relief valves on compressor oil separator pots (OS-1 through OS-5) that are missing relief valves.

k. Replace and calibrate the ammonia detectors in the ammonia machinery room.

l. Install and verify safety interlocks to shut down the gas-fired heaters on the loading dock when the presence of ammonia is detected.

m. Install and verify safety interlocks to shut down refrigeration equipment (*e.g.*, compressors) in ammonia machinery room during emergency shutdowns or when remote emergency stop is triggered.

n. Install and verify safety interlocks to shut down ancillary electrical equipment (*e.g.*, air compressors, portable lights, etc.) in ammonia machinery room during emergency shutdowns or when remote emergency stop is triggered.

o. Modify M&M control system to prevent ammonia detectors being put in bypass for more than an hour during maintenance.

p. Install/repair ammonia detection system and install audio/visual ammonia detection alarms outside of each room containing ammonia piping and equipment.

q. Re-install fire/smoke and carbon monoxide detection system in ammonia machinery room.

r. Provide proper relief header discharge height for the ice maker relief piping.

s. Provide proper relief header discharge height for the main relief header.

t. Remove the Armaflex insulation on the dock piping and evaluate condition of the piping.

u. Provide two means of egress off of the roof.

v. Provide two means of egress from ammonia machinery room (second floor) and provide barriers or means of fall protection for the two sets of double doors located on the second floor in the ammonia machinery room.

w. Protect and secure storm drains in and around ammonia machinery room from inadvertent releases of process chemicals to the storm drain system and navigable waters.

x. Remove remaining oil residue from overhead piping in ammonia machinery room.

y. Paint, insulate, and label all process piping, vessels, equipment, and valves according to industry standards and code.

z. Conduct a hazard review on the ammonia refrigeration system.

22. On July 6, 2016, EPA issued a letter to Respondent providing notice of potential General Duty Clause violations (the "Letter"). The Letter included a version of the chart in Attachment 1 and provided advance warning that EPA would be issuing an order to ensure compliance with the General Duty Clause. To expedite compliance, the Letter also outlined the first few steps that such an order would likely require. The Letter also included a copy of EPA's expert's report, which listed the critical actions that would need to be performed immediately to prevent further endangering Facility employees and the public. Finally, the letter enclosed an information request pursuant to CAA Section 114(a)(1), 42 U.S.C. § 7414(a)(1) ("Information Request").

23. Respondent was responsive to the Letter, and since July 6, 2016, EPA and Respondent have been in contact. Respondent has reported that it has taken the following interim steps to improve safety:

a. Respondent hired a third-party ammonia refrigeration system expert team to help perform the work that will be required by the NOV/AO.

b. Respondent removed a large amount of the System's ammonia charge in April 2016, and documentation was provided to EPA, but some residual ammonia remained in the System;

c. The Facility's ammonia refrigeration System is not currently in operation;

d. On August 4, 2016, Respondent notified EPA of its decision to remove the remaining ammonia in the System under negative pressure.

e. Respondent responded to the Information Request by submitting the requested information.

NOTICE OF VIOLATION

I. FAILURE TO IDENTIFY HAZARDS

24. The allegations in Paragraphs 1 through 23 are hereby realleged and incorporated herein by reference.

25. Pursuant to the General Duty Clause, Section 112(r)(1) of the CAA, 42 U.S.C. § 7412(r)(1), owners and operators of stationary sources producing, processing, handling or storing extremely hazardous substances have a general duty, in the same manner and to the same extent as Section 654 of Title 29, to, among other things, identify hazards which may result from accidental releases of such substances, using appropriate hazard assessment techniques.

26. As alleged in Paragraphs 9 through 13, Respondent owns or operates a stationary

source that handles and stores anhydrous ammonia, an extremely hazardous substance. Accordingly, Respondent is subject to the General Duty Clause.

27. Industry standards and guidelines with respect to ammonia refrigeration systems are found in, among other places, ANSI/IIAR Standard 2, ANSI/ASHRAE Standard 15, IIAR bulletins, the IIAR ARM Program, and other materials consistently relied upon in the refrigeration industry.

28. The recommended industry practice and standard of care for identifying, analyzing, and evaluating potential hazards associated with ammonia refrigeration systems of the same size and type as Respondent's System is to use, among other things, standard, industry-developed hazard identification checklists, a "What If" analysis, or a Hazard and Operability (a/k/a "HAZOP") study. IIAR has developed checklists for this purpose. *See, e.g.*, IIAR ARM Program, Section 10 and Appendix 10.1. *See also* IIAR's Bulletin No. 110, *Startup, Inspection, and Maintenance of Ammonia Mechanical Refrigeration Systems,* Section 5.2.1; and U.S. Environmental Protection Agency, *Guidance for Implementation of the General Duty Clause Clean Air Act Section 112(r)(1)*, May 2000 ("EPA's GDC Guidance"), Section 2.3.1, currently available at: `https://www.epa.gov/enforcement/guidance-implementation-general-duty-clause-clean-air-act-caa-section-112r1-may-2000`.

29. According to EPA's GDC Guidance, the General Duty Clause's duty to identify hazards that may result from hazardous releases requires determining: (a) the intrinsic hazards of the chemicals used in the processes; (b) the risks of accidental releases from the processes through possible release scenarios; and (c) the potential effect of these releases on the public and the environment. The document that contains this analysis is often referred to as a process

hazard analysis or process hazard review ("Process Hazard Review").

30. As described in Paragraphs 19 through 21 above and in Attachment 1, EPA Inspectors and the Expert observed potentially dangerous conditions at the Facility that indicated a failure to identify hazards associated with the System.

31. Respondent has not conducted a Process Hazard Review t to identify hazards posed by the System. Also, Respondent had inadequate documentation available about the technology and equipment involved with the System to properly perform a Process Hazard Review. For example, the Facility did not have pressure relief vent calculations to verify that the vent header was appropriately sized. In addition, the Facility lacked important information about various pressure vessels at the Facility, including vessels that were missing "U" or "UM" stamps, nameplates, National Board numbers, or other information about the vessels to show they were fit for service.

32. Accordingly, Respondent has violated the General Duty Clause's requirement to identify hazards associated with the refrigeration system using industry-recognized hazard assessment techniques, in violation of Section 112(r)(1) of the CAA, 42 U.S.C. § 7412(r)(1).

II. FAILURE TO DESIGN AND MAINTAIN A SAFE FACILITY

33. The allegations in Paragraphs 1 through 32 are hereby realleged and incorporated herein by reference.

34. Pursuant to the General Duty Clause, Section 112(r)(1) of the CAA, 42 U.S.C. § 7412(r)(1), owners and operators of stationary sources producing, processing, handling, or storing extremely hazardous substances have a second general duty to, in the same manner and to the same extent as Section 654 of Title 29, design and maintain a safe facility, taking such steps as are necessary to prevent releases.

35. The recommended industry practice and standard of care for designing and maintaining a safe facility with an ammonia refrigeration system of the same size and type as Respondent's System is to base design considerations upon applicable design codes, federal and state regulations, and industry guidelines to prevent releases or minimize their impacts as well as to develop and implement standard operating procedures, maintenance programs, personnel training programs, management of change practices, incident investigation procedures, self-audits, and preventative maintenance programs. IIAR, ASHRAE and others have developed standards and guidelines for this purpose, such as the IIAR Bulletins, ANSI/IIAR 2-2008, the IIAR ARM Program, and ANSI/ASHRAE Standard 15. *See also* EPA's GDC Guidance, Section 2.3.2 and National Fire Protection Association 1, Fire Code, Section 53.

36. At all times relevant to the allegations in this NOV/AO, Respondent failed in its general duty to design and maintain the Facility as a safe facility, taking such steps as are necessary to prevent a release of an extremely hazardous substance, in at least the respects listed in the subparagraphs below. Attachment 1 provides more information about each listed hazard, such as examples of industry standards of care that address each type of hazard, and an Expert-reviewed explanation of how each hazard could result in a harmful release or exacerbate the consequences of a release. The industry standards of care illustrate how the ammonia refrigeration industry has recognized hazards associated with designing and maintaining an ammonia refrigeration system and developed measures to reduce such hazards. Some of the hazards listed in the subparagraphs below also have resulted in violations of the General Duty Clause's third duty, as further discussed in Count III.

a. ***Inadequate information available about System:*** At the time of the EPA inspections, inadequate documentation was available about the technology and equipment of the

ammonia refrigeration System.[2] For example, the Piping and Instrumentation Diagram ("P&ID") or floor plan posted in the ammonia machinery room did not include some key equipment present in the room. Complete Piping and Instrumentation Diagrams allow Facility personnel, inspectors, or emergency responders to identify the location of key System equipment, piping, and valves. Nor did Respondent have pressure relief vent calculations to verify that the vent header was appropriately sized. In addition, the Facility lacked important information about various pressure vessels at the Facility, including, vessels were missing "U" or "UM" stamps, nameplates, National Board numbers or other information about the vessels to show they were fit for service. Such information is critical to conducting a Process Hazard Review, writing standard operating procedures, and setting up an appropriate preventative maintenance program. Attachment 1, pages 2 to 3, lists examples of industry standards of care for documenting ammonia refrigeration system information.

b. ***Inadequate pressure relief devices:*** At the time of the EPA inspections, five of the oil separator pressure vessels were not protected by pressure relief devices to safely relieve pressure building that could occur during fires or abnormal conditions. Attachment 1, page 4, lists examples of industry standards of care for providing appropriate pressure relief devices.

c. ***Excessive corrosion***: At the time of the EPA inspections, there was excessive corrosion on refrigeration piping in the Facility's ammonia machinery room. Also, on the roof, the inspectors observed several instances of rusted valves and piping around uninsulated valve manifolds, risking ammonia release if corrosion continues to the point of failure. EPA Inspectors noted surface corrosion, pitting, and flaking on specific pipes and

[2] Since the EPA inspections, Respondent has assembled a complete set of P&IDs for the System.

piping components, reducing the useful life of the equipment. Attachment 1, pages 4-5, lists examples of industry standards of care for avoiding corrosion.

d. ***Inadequate insulation***: At the time of the EPA inspections, there was damaged, stained, and missing insulation in multiple areas on ammonia piping and vessels in the Facility's ammonia machinery room, roof, and in other areas containing ammonia piping. In addition, on the loading dock, the inspectors observed a section of ammonia piping wrapped in a type of insulation that retains moisture and liquid between the insulation and piping, increasing the likelihood of corrosion. Appropriate vapor barriers protect pipes and vessels from moisture, which causes corrosion. Corroded pipes and vessels can break or succumb to pressure, causing an ammonia release. Attachment 1, pages 5-6, lists examples of industry standards of care for appropriate insulation.

e. ***Faulty ventilation:*** The ammonia machinery room's mechanical air intake louvers do not appear to be of the type that use power to close and otherwise spring open automatically; the louvers did not open during the Release; and, the motor and louvers were not properly assembled together. During the first inspection, the emergency ventilation was turned on, but the louvers did not open. The louvers were in the closed position when power was off.[3] Without adequate ventilation, ammonia vapors are more likely to build up to levels that present significant inhalation and dermal hazards or that risk causing fire or explosion. Accordingly, in addition to being a violation of the duty to design and maintain a safe facility, this condition also is a violation of the duty to minimize consequences of releases that do occur, as alleged in

[3] In its response to EPA's Information Request, Respondent opined that the louvers may have been mechanically operable, but did not open because the link to the ammonia machinery room detectors was disabled. However, the recommended industry practice and standard of care is for motorized dampers or louvers to be of the type that use power to close and otherwise spring open automatically. For examples of industry standards, *see* ANSI/IIAR 2-2014 § 6.14.5.6 and ANSI/IIAR 2-2008 (2012 ed.) § 13.3.3.4.

Count III, below. Attachment 1, pages 6-7, lists examples of industry standards of care for ventilating ammonia machinery rooms.

f. ***Lack of functioning audio/visual alarms and inadequate vapor detector:*** At the time of the EPA inspections, there were no visual and audible alarms in the ammonia machinery room. Outside the primary entrance to the ammonia machinery room was an inadequately labeled visual alarm, but no audio alarm was present. There were no visual and audible alarms near the second-floor doors of the ammonia machinery room should someone attempt to enter the room from the outside (*e.g.*, by ladder or fire truck). Moreover, the M&M system printout indicated that, although the vapor detector in the ammonia machinery room was functioning to detect levels of ammonia during the March 23, 2016 Release, the safety interlocks between this detector and the alarm/system shutdown had been disabled prior to the Release. The interlock between the detector and the ventilation system and the compressors was also disabled. In addition, the ammonia detectors in the ammonia machinery room, cooler rooms, freezer room, and loading dock near the ceiling had not been calibrated since January 2015, and Respondent could not provide any records of bump tests. In addition, the fish cutting room at the Facility was located in an enclosed space within Cooler Room A, but it did not contain an ammonia detector. Because the room is enclosed, the ammonia detector in Cooler Room A near the ceiling in the center of the room would not provide adequate warning of an ammonia release and presents a hazard to employees working in the cutting room. Ammonia detectors and alarms provide early warning that a release is taking place, enabling a quick system shutdown and response, and protecting workers, emergency responders, and the public from a larger release. Under the local fire code, such detectors must also automatically turn off electrical power when they sense vapors at certain concentrations, which could prevent further

releases. Failure to have vapor detectors also is a violation of the duty to minimize consequences of releases that do occur, as alleged in Count III, below. Attachment 1, pages 7-9 and 30, lists examples of industry standards of care for vapor detectors in ammonia machinery rooms; and, Attachment 1 at page 11 lists citations to the fire code.

g. ***Problems with remote controls for activating ventilation and shutting down refrigeration equipment:*** At the time of the EPA inspections, there was a remote emergency shutdown control for compressors and a ventilation switch outside the door on the first floor below the ammonia machinery room located on the second floor of the building. However, the controls lacked clear signage about their function and were not easily accessible to emergency responders during the Release, due to a missing key. Moreover, the existing remote controls would have been difficult for a person working in the machinery room to access in an emergency, given that the ammonia machinery room was upstairs from the remote controls, with no separate door or remote controls located upstairs. Also, the emergency ventilation system was not working on the day of EPA's March 24, 2016 Inspection. During that Inspection, the emergency ventilation was turned on, but the air intake louvers were closed. Finally, the emergency shut-off switch did not turn off all the electrical power to the ammonia machinery room, risking ignition of ammonia vapors during a release; an air compressor (which was not part of the refrigeration System) came on during EPA's March 24, 2016 Inspection although the emergency shut-off for the refrigeration system compressors was activated. The lack of properly functioning switches creates a risk of harm to workers and emergency responders who cannot quickly shut down or properly ventilate a machinery room without entering it, because the room could have dangerous levels of vapors. The delay could also contribute to a longer ammonia release time, exacerbating risks to workers, emergency responders, and people off-site. This

hazard also is a violation of the duty to minimize consequences of releases that do occur, as alleged in Count III, below. Attachment 1 at pages 10-12, lists examples of industry standards of care for remote emergency shut-down controls.

h. ***Electrical and fire hazards:*** At the time of the EPA inspections, there were open electrical junction boxes, loose wiring, and light sockets without bulbs present in the first floor maintenance room below the second floor ammonia machinery room and in the ammonia machinery room itself. The electrical switchgear room inside of the expansion to the ammonia machinery room contained an electrical conduit that was dripping water from a fitting, indicating that water was present inside the conduit and presenting an electrical hazard. There were also combustible materials in areas that were not separated from the ammonia machinery room (*e.g.*, wooden stairs, flammable items stored on first floor). These conditions increase the risk of fire or explosion in the event of an ammonia release because ammonia is flammable at certain concentrations. A fire or explosion also could cause a much bigger release of ammonia than would otherwise occur. Accordingly, this condition also is a violation of the duty to minimize consequences of releases that do occur, as alleged in Count III, below. Attachment 1, pages 14-15, lists examples of industry standards of care for fire safety in ammonia machinery rooms.

i. ***Inadequate signage and labeling on System***: At the time of EPA's inspections, there was inadequate signage and labeling on various parts of the System, which meant that workers maintaining the system and emergency responders responding to releases did not have the information needed to safely perform their jobs. Signs and posted information can provide a level of protection in addition to training and operating procedures, keeping workers from inadvertently causing releases and allowing responders to quickly understand the System.

Examples of deficient labeling and signage include the following:

(1) The Facility's ammonia machinery room door was not adequately labeled to: warn of the hazards of entering a room with ammonia-containing machinery; restrict access to authorized personnel; provide appropriate information about alarms; and provide information about emergency procedures, which could increase the chance of inadvertent exposure to ammonia and frustrate efforts to react quickly and safely during an ammonia emergency;

(2) There were no emergency shutdown instructions posted on signs at the Facility;

(3) There was not a legible, permanent sign anywhere on the System indicating: the name and address of the installer; the refrigerant number and amount of refrigerant in the System; lubricant identity and amount; and, the field test pressure(s) applied;

(4) A significant amount of piping and equipment in the Facility's ammonia machinery room, roof, and other ammonia-containing areas were inadequately labeled or missing labeling to indicate contents, direction of flow, physical state (*i.e.*, liquid or vapor), pressure level (*i.e.*, high or low). Nor were there distinctive markers for other system components (*e.g.*, accumulator, etc.);

(5) The main shut-off valves (King Valves) for the high pressure receivers were not identified with prominent signs;

(6) There were no tags or other documentation for pressure relief valves showing the date of installation and when they had last been inspected.

Some of the labeling and signage deficiencies also violate the duty to minimize consequences of

releases that do occur, as alleged in Count III, below. Examples of industry standards of care for a permanent, legible sign on the System are provided in Attachment 1, page 17-18; on page 20-21 for piping and component labeling; on page 21 for King Valve labeling; on page 15-16 for door labeling; and on page 22 for pressure relief valve labeling.

j. ***Access and Egress to/from equipment and room:*** At the time of the EPA inspections, the Facility lacked clear and unobstructed approaches to the ammonia refrigeration machinery for inspection, service, and emergency shutdown with adequate clearances for maintenance of equipment. For example, the Pilot Receiver pipe that broke in the March 23, 2016 Release was in the way of the oil change point for the accumulator located behind the Pilot Receiver. Also, the ammonia machinery room lacked safe access to the equipment on the roof because the roof could only be accessed by an unsecured ladder placed precariously at the top of the wooden steps leading downstairs. Also, at least one isolation valve on the Control Pressure Receiver was located approximately eight to ten feet above ground level with no permanent platform or ladder or chain for operation to access the valve in the case of an emergency. In addition, the ammonia machinery room was very dark, making it difficult to see, inspect, and move around equipment. Finally, access to and egress from the ammonia machinery room itself was unsafe. The only access and egress was up wooden, combustible stairs, and the upstairs door leading to open air had no steps, landing, balcony or adequate protection to prevent someone from falling to the ground. Failure to provide appropriate access and egress to equipment in an ammonia machinery room makes it very difficult to access machinery for proper preventative maintenance, risking an ammonia release from improperly-maintained equipment. Given the configuration of equipment and lack of support under oil drain pipes, these conditions could lead to inadvertent breakage of these pipes. Likewise, emergency responders would have a

hard time accessing equipment, which could increase the duration of a release. Also, the access/egress deficiencies put workers at risk in the event of an ammonia release. This condition also is a violation of the duty to minimize consequences of releases that do occur, as alleged in Count III, below. Examples of industry standards of care for providing a clear and unobstructed approach to refrigeration machinery are found in Attachment 1 at pages 22-24.

k. ***Excessive ice on piping and valves***: At the time of the EPA inspections, there was excessive ice buildup on refrigeration piping, the control pressure receiver, and valves in the Facility's ammonia machinery room. Ice buildup can weigh down piping, risking collapse and ammonia release. It also exposes pipes to moisture, which can cause corrosion and pipe failure. Examples of industry standards of care for reducing ice build-up are found in Attachment 1 at pages 24-25.

l. ***Failure to safeguard piping, valves, and other System components adequately from accidental damage or rupture by external sources:*** At the time of EPA's inspections, in the ammonia machinery room, drain lines extending from tanks into walkways were not supported or protected from physical impact. Also, in Cooler Room A, the inspectors observed pallet racks installed near the ceiling and directly underneath ammonia piping and evaporator units. The inspectors observed a damaged drainage pan under one of the Cooler A evaporators, indicating that a forklift or other equipment had run into the pan. The inspectors also observed a low unprotected liquid trap on ammonia piping running above one of the loading dock bays. The temporary refrigeration piping and electrical cords running across the floor in the loading dock area present a trip hazard for employees working in the area. Failure to safeguard System components creates a risk of ammonia release from accidental damage to system components. Examples of industry standards of care for safeguarding ammonia

refrigeration components are found in Attachment 1 at page 25.

m. ***Computerized controls and interlocks for the System were not fully functional:*** At the time of EPA's inspections, the Facility had a computerized panel to help control the System, but the controls did not appear to be properly calibrated, as they read out the wrong time. Also, the interlocks triggered by the ammonia detector had been disabled prior to the Release, such that a detection of high ammonia levels would not automatically turn on ventilation, activate alarms, or shut off machinery. This computerized system was intended to provide an extra measure of safety to monitor performance of the System and, in the case of an ammonia leak, turn on ventilation, activate alarms, and shut down compressors. This condition also is a violation of the duty to minimize consequences of releases that do occur, as alleged in Count III, below. Examples of industry standards of care for proper instruments, sensing devices, interlocks, and emergency shutdown systems are found in Attachment 1 at page 27.

n. ***Failure to maintain piping and investigate and repair ammonia leaks:*** At the time of EPA's inspections, copper water piping around the ammonia feed line to the evaporator in the fish cutting room was oxidized with a bluish-green patina, indicating that ammonia may have been leaking from the refrigeration valves or piping at some point in the past. Leaking valves or piping could lead to a release of ammonia, endangering employees. Also, a small, slow leak could get worse if not addressed. This condition also is a violation of the duty to minimize consequences of releases that do occur, as alleged in Count III, below. Examples of industry standards of care for maintaining piping and investigating and repairing ammonia leaks are found in Attachment 1 at page 30.

o. ***Failure to have adequate support for System components:*** At the time of EPA's inspections, one of the support legs on an icemaker in Cooler Room B was not bolted

to the floor. Adequate supports for ammonia system machinery can prevent detrimental vibration or movement that might make the equipment fail and release ammonia. Examples of industry standards of care for adequate support for ammonia refrigeration equipment are found in Attachment 1 at page 31.

37. Accordingly, Respondent violated the requirement to design and maintain a safe facility, taking such steps as are necessary to prevent a release of an extremely hazardous substance as required under the General Duty Clause, Section 112(r)(1) of the CAA, 42 U.S.C. § 7412(r)(1), by having the following deficiencies: (a) inadequate information about the technology and equipment of the Facility's ammonia refrigeration System; (b) inadequate pressure relief devices; (c) excessive corrosion; (d) inadequate insulation; (e) faulty ventilation; (f) lack of functioning audio/visual alarms and inadequate vapor detector; (g) problems with remote controls for activating ventilation and shutting down refrigeration equipment; (h) electrical and fire hazards; (i) inadequate signage and labeling on System; (j) inadequate access and egress to/from equipment and the ammonia machinery room; (k) excessive ice on piping and valves; (l) failure to safeguard piping, valves, and other System components adequately from accidental damage or rupture by external sources; (m) computerized controls and interlocks for the System were not fully functional; (n) failure to maintain piping and investigate and repair ammonia leaks; and, (o) failure to have adequate support for System components.

III. FAILURE TO MINIMIZE THE CONSEQUENCES OF ACCIDENTAL RELEASES THAT DO OCCUR

38. The allegations in Paragraphs 1 through 37 are hereby realleged and incorporated herein by reference.

39. Pursuant to the General Duty Clause, Section 112(r)(1) of the CAA, 42 U.S.C. § 7412(r)(1), owners and operators of stationary sources producing, processing, handling, or storing extremely hazardous substances have a third general duty to, in the same manner and to the same extent as Section 654 of Title 29, minimize the consequences of any accidental releases of anhydrous ammonia which do occur.

40. Industry standards and guidelines for minimizing the consequence of an accidental release from ammonia refrigeration systems are found, among other things, in the IIAR ARM Program, ANSI/IIAR Standard 2, ANSI/ASHRAE Standard 15, IIAR bulletins, and other materials (including updates and revisions) consistently relied upon by refrigeration experts. They include design and maintenance measures to minimize the severity and duration of releases that do occur, such as, among other things, standards for vapor detection, alarms, equipment and door labeling, emergency shut-off switches, ventilation, keeping combustible materials and electrical hazards away from ammonia, safe oil drain systems, tight construction of machinery rooms, and designing safe pressure relief valves and associated piping; reducing obstructions for responders; and having emergency eye wash stations and showers.

41. In addition, EPA's General Duty Clause Guidance discusses the standard of care for emergency response planning at facilities that have extremely hazardous substances, such as anhydrous ammonia. The recommended industry practice and standard of care for emergency planning at ammonia refrigeration systems of this size is to, *inter alia*, design and implement an emergency response plan that specifically addresses release scenarios developed from hazard analyses and facility-based knowledge, identifies emergency response equipment and its whereabouts, includes communication with and involvement of emergency planning and response officials (*e.g.*, the Local Emergency Response Planning Committee), incorporates

accident training for employees, and involves conducting periodic exercises to ensure that the plan is adequate to address emergency scenarios. EPA's GDC Guidance at 16-18. IIAR, ANSI, ASHRAE, and other organizations have developed standards and guidelines for this purpose, including, among other things, ANSI/IIAR 2-2008, the IIAR ARM Program (2005), and ANSI/ASHRAE Standard 15. For example, Section 7 of IIAR's ARM Program for smaller ammonia refrigeration systems provides that refrigeration facilities should develop an up-to-date, facility specific emergency response plan that accurately describes the facility and the potentially affected population. Such a plan should include, among other items, types of evacuation, evacuation procedures and routes, procedures for employees who remain to maintain critical operations, procedures for accounting for evacuated employees, any employee's rescue and medical duties, and means for reporting emergencies. An adequate emergency response program should also identify procedures for responding to an ammonia release, including shutting the system down, starting emergency ventilation, and coordinating with relevant off-site emergency responders. IIAR's ARM Program, Section 7.

42. At all times relevant to the allegations in this NOV/AO, Respondent failed in its general duty to minimize the consequences of an accidental release of an extremely hazardous substance at or from the Facility, in accordance with applicable industry standards for systems of this size, in at least the following respects. Examples of industry standards of care are found in Attachment 1.

Design and maintenance measures to minimize releases that do occur:

a. ***Faulty ventilation:*** As discussed in Count II, the ammonia machinery room's mechanical air intake louvers do not appear to be of the type that use power to close and otherwise spring open automatically; the louvers did not open during the Release; and, the motor

and louvers were not properly assembled together. During the first inspection, the emergency ventilation was turned on, but the louvers did not open. The louvers were in the closed position when power was off. Without adequate ventilation, vapors are more likely to build up to levels that are significant inhalation and dermal hazards or that risk causing fire or explosion.

b. ***Lack of functioning audio/visual alarms and problems with ammonia detector:*** As discussed in Count II, at the time of the EPA inspections, there were no visual and audible alarms in the ammonia machinery room. Outside the primary entrance to the ammonia machinery room was an inadequately labeled visual alarm, but no audio alarm was present. There were no visual and audible alarms near the second-floor doors of the ammonia machinery room should someone attempt to enter the room from the outside *(e.g.*, by ladder or fire truck). Moreover, the M&M system printout indicated that, although the vapor detector in the ammonia machinery room was functioning to detect levels of ammonia during the March 23, 2016 release, the safety interlocks between this detector and the alarm/system shutdown had been disabled. The interlock between the detector and the ventilation system and the compressors was also disabled. In addition, the ammonia detectors in the ammonia machinery room, cooler rooms, freezer room, and loading dock near the ceiling had not been calibrated since January 2015, and Respondent could not provide any records of bump tests. In addition, the fish cutting room at the Facility was located in an enclosed space within Cooler Room A, but it did not contain an ammonia detector. Because the room is enclosed, the ammonia detector in Cooler Room A near the ceiling in the center of the room would not provide adequate warning of an ammonia release and presents a hazard to employees working in the cutting room. Ammonia detectors and alarms provide early warning that a release is taking place, enabling a quick system shutdown and response, and protecting workers, emergency responders, and the public from a larger release.

Under the local fire code, such detectors must also automatically turn off electrical power when they sense vapors at certain concentrations, which could prevent further releases.

c. ***Problems with remote controls for activating ventilation and shutting down refrigeration equipment:*** As discussed in Count II, at the time of the EPA inspections, there was a remote emergency shutdown control for compressors and a ventilation switch outside the door on the first floor below the ammonia machinery room located on the second floor of the building. However, the controls lacked clear signage about their function and were not easily accessible to emergency responders during the Release, due to a missing key. Moreover, the existing remote controls would have been difficult for a person working in the machinery room to access in an emergency, given that the ammonia machinery room was upstairs from the remote controls, with no separate door or remote controls located upstairs. Also, the emergency ventilation system was not working on the day of EPA's March 24, 2016 Inspection. During that Inspection, the emergency ventilation was turned on, but the air intake louvers were closed. Finally, the emergency shut-off switch did not turn off all the electrical power to the ammonia machinery room, risking ignition of ammonia vapors during a release; an air compressor (which was not part of the refrigeration System) came on during EPA's March 24, 2016 Inspection although the emergency shut-off for the refrigeration system compressors was activated. The lack of properly functioning switches creates a risk of harm to workers and emergency responders who cannot quickly shut down or properly ventilate a machinery room without entering it, because the room could have dangerous levels of vapors. The delay could also contribute to a longer ammonia release time, exacerbating risks to workers, emergency responders, and people off-site.

d. ***Pressure Relief Deficiencies***: The System had many deficiencies with the locations of pressure relief devices and headers. Improperly-placed discharge reliefs and exhaust

fans can result in ammonia being sprayed on people during a release, further exacerbating the consequence of a release. The following deficiencies with pressure relief valves or systems could exacerbate the consequences of any release that did occur:

i. The ammonia machinery room pressure relief vent line was located less than 7.5 feet above the Cooler Room B roof level.

ii. All of the high pressure relief vent lines and the emergency exhaust fan discharged less than 20 feet from the property line.

Examples of industry standards of care for locations of pressure relief devices and headers are found in Attachment 1 at pages 12-13.

e. ***Electrical and fire hazards:*** As discussed in Count II, at the time of the EPA inspections, there were open electrical junction boxes, loose wiring, and light sockets without bulbs present in the first floor maintenance room below the second floor ammonia machinery room and in the ammonia machinery room itself. The electrical switchgear room inside of the expansion to the ammonia machinery room contained an electrical conduit that was dripping water from a fitting, indicating that water was present inside the conduit and presenting an electrical hazard. There were also combustible materials in areas that were not separated from the ammonia machinery room (*e.g.*, wooden stairs, flammable items stored on first floor). These conditions increase the risk of fire or explosion in the event of an ammonia release because ammonia is flammable at certain concentrations. A fire or explosion also could cause a much bigger release of ammonia than would otherwise occur.

f. ***Inadequate signage and labeling on System***: As discussed in Count II, above, there was inadequate signage and labeling on various parts of the System, including doors, pipes, valves, and equipment. In addition, there were no emergency shutdown instructions posted on

signs at the Facility. The lack of signage and labeling could prevent workers and emergency responders responding to releases from having the information they would need to safely and timely perform their jobs. Signs and posted information provide a level of protection in addition to worker training and operating procedures.

g. ***Machinery Room Door Deficiencies***: In addition to being inadequately labeled, the machinery room door was not tight-fitting and self-closing. In the event of an ammonia release inside the machinery room, the failure to have a tight-fitting and self-closing door risks the spread of ammonia vapors to other parts of the building and outdoors. Examples of industry standards of care for ammonia machinery room doors are found in Attachment 1 at pages 18-19.

h. ***Machinery room not sealed tight:*** The ammonia machinery room walls contained holes and gaps for piping that were not sealed. Should an ammonia release occur in the ammonia machinery room, these gaps and holes would increase the risk associated with a release by allowing ammonia vapors to spread to other parts of the building or outside, putting employees and responders at risk. Examples of industry standards of care for sealing machinery rooms are found in Attachment 1 at pages 19-20.

i. ***Access and Egress to/from equipment and room:*** As discussed in Count II, at the time of the EPA inspections, the Facility lacked clear and unobstructed approaches to the ammonia refrigeration machinery for inspection, service, and emergency shutdown with adequate clearances for maintenance of equipment. For example, the Pilot Receiver pipe that broke in the March 23, 2016 Release was in the way of the oil change point for the accumulator located behind the Pilot Receiver. Also, the ammonia machinery room lacked safe access to the equipment on the roof because the roof could only be accessed by an unsecured ladder placed precariously at the top of the wooden steps leading downstairs. Also, at least one isolation valve

on the Control Pressure Receiver was located approximately eight to ten feet above ground level with no permanent platform or ladder or chain for operation to access the valve in the case of an emergency. In addition, the ammonia machinery room was very dark, making it difficult to see, inspect, and move around equipment. Finally, access to and egress from the ammonia machinery room itself was unsafe. The only access and egress was up wooden, combustible stairs, and the upstairs door leading to open air had no steps, landing, balcony or adequate protection to prevent someone from falling to the ground. Failure to provide appropriate access and egress to equipment in an ammonia machinery room makes it very difficult to access machinery for proper preventative maintenance, risking an ammonia release from improperly-maintained equipment. Given the configuration of equipment and lack of support under oil drain pipes, these conditions could lead to inadvertent breakage of these pipes. Likewise, emergency responders would have a hard time accessing equipment, which could increase the duration of a release. Also, the access/egress deficiencies put workers at risk in the event of an ammonia release.

j. ***Computerized controls and interlocks for the System were not fully functional:*** As discussed in Count II, at the time of EPA's inspections, the Facility had a computerized panel to help control the System, but the controls did not appear to be properly calibrated, as it read out the wrong time. Also, the interlocks triggered by the ammonia detector had been disabled prior to the Release, such that a detection of high ammonia levels would not automatically turn on ventilation, activate alarms, or shut off machinery. This computerized system was intended to provide an extra measure of safety to monitor performance of the System and, in the case of an ammonia leak, turn on ventilation, activate alarms, and shut down compressors.

k. ***Lack of proper eyewash and safety showers:*** At the time of EPA's inspections, the Facility lacked a proper eyewash station and safety shower inside or immediately outside the

maintenance room/ammonia machinery room. Although the Facility did have an eyewash station, it lacked a safety shower, and it was located at the bottom of the wooden stairs which made it not easily accessible by a worker in the ammonia machinery room upstairs. When an EPA inspector tapped on the gravity-fed eyewash station during EPA's March 24, 2016 Inspection, the eyewash station sounded hollow (*i.e.*, without much water). Lack of a proper eyewash station and safety shower makes it difficult for emergency responders and workers to safely respond to releases and wash off corrosive and toxic chemicals like ammonia in the event of exposure. Examples of industry standards of care for eyewash stations and safety showers are in Attachment 1 at page 28.

l. ***Improper floor drains:*** At the time of EPA's inspections, the floor drains in the first floor maintenance area and second floor ammonia machinery room did not have means to prevent the entry of spilled materials such as oil and ammonia. The drains are connected with the storm drain system, which may lead to Boston Harbor. Because the Facility's System contained both ammonia and oil, it is foreseeable that both substances could be released into the water through the Facility's storm drains causing environmental damage and exacerbating the negative consequences of any releases that do occur. Examples of industry standards of care for drainage systems are in Attachment 1 at page 29.

m. ***Inadequate windsock:*** At the time of EPA's inspections, the windsock observed at the Facility could not be seen from multiple locations around the Facility. Properly placed windsocks help minimize the consequences of releases that do occur by helping emergency responders understand what direction the wind may be carrying toxic ammonia plumes. They can issue shelter-in-place orders or muster evacuees accordingly. Examples of industry standards of care are in Attachment 1 at page 29.

n. ***Failure to maintain piping and investigate and repair ammonia leaks:*** As discussed in Count II, at the time of EPA's inspections, copper water piping around the ammonia feed line to the evaporator in the fish cutting room was oxidized with a bluish-green patina, indicating that ammonia may have been leaking from the refrigeration valves or piping at some point in the past. Leaking valves or piping could lead to a release of ammonia, endangering employees. Also, a small, slow leak could get worse if not addressed.

Emergency response and preparedness planning to minimize releases:

o. ***Lack of complete chemical inventory reporting and inadequate emergency action plan or coordination with fire department:*** At the time of EPA's inspections, the Facility had more than 500 pounds of anhydrous ammonia present in the System, but the Facility had not submitted chemical inventory reports for reporting year 2015 to the Boston Fire Department or to the Boston Local Emergency Planning Committee, which is also a violation of EPCRA and federal regulations promulgated thereunder at 40 C.F.R. § 370.10. In addition, the Facility failed to report sulfuric acid and lead present at the Facility. Lack of coordination with the local fire department and other emergency responders may impede proper emergency response. Also, the Facility had an inadequate emergency action or response plan. Examples of industry standards of care for emergency planning and coordination are found in Attachment 1 at pages 27 and 31 and in Paragraph 41 above.

43. Accordingly, Respondent violated the requirement to minimize the consequences of any accidental release of anhydrous ammonia which does occur, as required under the General Duty Clause, Section 112(r)(1) of the CAA, 42 U.S.C. § 7412(r)(1), by having the following deficiencies: (a) faulty ventilation; (b) lack of functioning audio/visual alarms and problems with ammonia detector; (c) problems with remote controls for activating ventilation and shutting

down refrigeration equipment; (d) pressure relief deficiencies; (e) electrical and fire hazards; (f) inadequate signage and labeling on System; (g) machinery room door deficiencies; (h) machinery room not sealed tight; (i) inadequate access and egress to/from equipment and ammonia machinery room; (j) computerized controls and interlocks for the System were not fully functional; (k) lack of proper eyewash and safety showers; (l) improper floor drains; (m) inadequate windsock; (n) failure to maintain piping and investigate and repair ammonia leaks; and (o) lack of complete chemical inventory reporting and inadequate emergency action plan or coordination with fire department.

ADMINISTRATIVE ORDER

44. On August 4, 2016, Respondent proposed removing the remainder of the ammonia from the System and ceasing all operations at the Facility, because Respondent plans to move to a different facility. Removal of the ammonia would be an acceptable method for coming into compliance with the General Duty Clause.

45. On August 12, 2016, Respondent teleconferenced with EPA about the appropriate steps to remove the remaining ammonia from the System safely.

46. **Accordingly, it is hereby ordered that Respondent shall take the following actions:**

a. **As soon as possible, but no later than one (1) day after the effective date of this Order,** Respondent shall engage a third-party ammonia refrigeration system expert team ("Refrigeration Team") to help conduct the work required by this Order. The Refrigeration Team shall have experience: conducting process hazard analyses/reviews under CAA Section 112(r); have experience performing non-destructive testing (only if the System is to be restarted); be very knowledgeable about the industry codes and standards that apply to ammonia

refrigeration facilities; have experience shutting down ammonia refrigeration systems; and, have experience designing refrigeration systems to meet such codes and standards (or have access to someone who does have such design experience). EPA acknowledges that Respondent has engaged a qualified Refrigeration Team.

b. **If Respondent intends to remove the ammonia from the existing System, then, as soon as possible, but no later than five (5) days after the effective date of this Order,** Respondent and its Refrigeration Team shall, consistent with the August 12, 2016 teleconference with EPA and EPA's August 12, 2016 e-mail, and in consultation with the local fire department, the State Emergency Response Commission, a refrigeration contractor, and ammonia supplier,[4] develop and submit to EPA, a plan for removing all anhydrous ammonia from the System (the "Removal Plan"). The following elements, at a minimum, shall be included and addressed in the Removal Plan:

i. Identify the name or entity that will be engaged to remove and dispose of the ammonia;

ii. Proposed operating procedures for securing the System and pumping out the ammonia;

iii. A vacuum shall be put on the System in order to completely remove all anhydrous ammonia;

iv. All anhydrous ammonia shall be drawn back into the high pressure receiver in order to then be pumped out of the System;

v. The building shall be shut down and access shall be restricted to authorized personnel during the removal of the ammonia;

[4] Ammonia suppliers also perform ammonia pump-outs.

vi. A fire watch shall be instituted during the removal;

vii. The pressure vessels shall be removed or disabled so that the System cannot be re-started by the property owner or future lessees;

viii. The Removal Plan shall contain a schedule that shall, at a minimum, require removal of the ammonia by October 30, 2016 and removal/disabling of the pressure vessels by April 30, 2017.

ix. Respondent has submitted a draft Removal Plan to EPA.

c. **If ammonia is to stay in the System after October 30, 2016, as soon as possible, but no later than October 30, 2016,** Respondent shall submit to EPA a Work Plan to correct the violations cited in Counts I-III ("Work Plan") and refrain from adding more ammonia to the System until the Work Plan has been implemented. The Work Plan shall have the following components:

i. ***P&ID***: Develop a piping and instrumentation diagram (P&ID) of the System, signed by a professional engineer, and following industry standards.

ii. ***Process Hazard Review***: Conduct and submit a process hazard analysis/review to correct the violation cited in Count I above (Failure to Identify Hazards). This process hazard analysis/review shall follow industry standards and guidance and consider each hazard identified in Attachment 1. For industry standards, see, for example, IIAR's ARM, Section 10 (Hazard Review Procedures), which recommends completing safety checklists contained in Appendix 10.1, IIAR Bulletin 109, and other documents cited in Paragraphs 27-1. The process hazard analysis/review shall also include the Refrigeration Team's recommendations for addressing each Hazard ("Hazard") and a schedule for implementing those recommendations.

iii. ***Demonstrate Pressure Vessels are Fit for Service***: Provide U1-A forms for all pressure vessels in the System or otherwise demonstrate that the pressure vessels in the System are fit for service and meet state regulations and industry standards.

iv. ***Plan for Replacing/Repairing System***: Develop plan for addressing the compliance deficiencies in Counts II and III, the critical action items in Paragraphs 20 and 21, and the recommendations from the process hazard analysis/review required in the subparagraph above. The plan should also evaluate the need to remove ammonia from the System to make the System safe while compliance deficiencies are being addressed. The plan shall also propose interim measures to protect employees and the public until corrective actions can be completed (*e.g.*, fixing the air louvers for the ammonia machinery room, installing a functional alarm system, frequent inspections by a trained refrigeration technician, employee training, and emergency preparedness coordination with the fire department).

v. ***Schedule***: A schedule for completing the work in Paragraph 46(c), which shall be completed no later than May 30, 2017.

d. **Once approved by EPA, Respondent shall implement the Removal Plan or Work Plan referenced in Paragraph 46(b) and (c), in accordance with the approved schedules therein.**

e. **Within 14 days of completion of the work required by the Removal Plan or Work Plan referenced in Paragraph 46(b) and (c), Respondent shall submit a Removal Plan or Work Plan Completion Report.** This report shall contain the following information: (i) a written description of the work completed, any problems encountered, and the

solutions thereto; and (ii) evidence of completion of the work required, which shall include, but is not limited to:

1. A list (sign-in sheet) of all individuals who participated in completion of the work and were present at the Facility during completion of the work (name, title, organization, and responsibility)

2. Manifests: Copies of shipping/truck manifests; copies of manifests for ammonia, oil, and any other materials shipped off site as hazardous or non-hazardous waste (if not available within 14 days, to be provided as soon as possible thereafter);

3. The name and contact information for the individual who will serve as the contact for controlling/unlocking any lockout-tagout/disabled pressure vessels; and,

4. If a Work Plan is prepared and implemented pursuant to paragraph 46(c) above, a copy of the hazard review conducted, annotated with dates on which the recommendations therein were completed.

47. Approvals:

a. After review of any document that is required to be submitted pursuant to this NOV/AO (the "Submission"), including but not limited to the Removal Plan and Work Plan, EPA shall, in writing (i) approve the Submission; (ii) approve the Submission with specified conditions; (iii) approve part of the Submission and disapprove the remainder; or (iv) disapprove the Submission.

b. If the Submission is approved, Respondent shall take all actions required by the Submission in accordance with the schedules or requirements therein. If the Submission is conditionally approved or approved only in part, Respondent shall, upon written direction

from EPA, take all actions required by the Submission that EPA determines are technically severable from any disapproved portions.

c. If the Submission is disapproved in whole or in part, Respondent shall, within ten (10) days or other such time as EPA agrees in writing, correct all deficiencies and resubmit the Submission, or disapproved portion thereof, for approval in accordance with the preceding subparagraphs. If the resubmission is approved in whole or in part, Respondent shall proceed in accordance with the preceding paragraphs.

48. Notice: Respondent shall submit all notices, schedules, removal plans, work plans, and documentation required by this order by mail and e-mail to:

Len Wallace
RCRA, EPCRA, and Federal Programs Unit (SER)
Office of Environmental Stewardship
EPA Region 1
Mail Code: OES05-1
5 Post Office Square, Suite 100
Boston, MA 02109-3912
wallace.len@epa.gov

and

Laura Berry, Esq.
Regulatory Legal Division
Office of Environmental Stewardship
EPA Region 1
Mail Code: OES04-2
5 Post Office Square, Suite 100
Boston, MA 02109-3912
Berry.lauraj@epa.gov

ENFORCEMENT

49. At any time after the issuance of this NOV/AO, EPA may take any or all of the following actions: issue a further order requiring compliance with the Act; issue an administrative penalty order for up to $44,539 per day for each violation; or bring a civil or

criminal action seeking an injunction and penalties. See Sections 113(a)-(d) of the CAA, 42 U.S.C. §§ 7413(a)-(d); 40 C.F.R. Part 19; and 81 Fed. Reg. 43091-43096 (July 1, 2016). Be advised that Section 113(e)(2) of the Act, 42 U.S.C. § 7413(e)(2), contains provisions that affect the burden of proof with respect to violations which continue following issuance of a Notice of Violation.

50. Be advised that issuance of this NOV/AO does not preclude EPA from electing to pursue any other remedies or sanctions authorized by law that are available to address these and other violations. This NOV/AO does not resolve Respondent's liability for past violations of the Act or for any violations that continue from the date of this NOV/AO up to the date of compliance.

51. Neither EPA nor the United States, by the issuance of this NOV/AO, assumes any liability for any acts or omissions by Respondent or Respondent's employees, agents, contractors or consultants engaged to carry out any action or activity pursuant to this NOV/AO; nor shall EPA or the United States be held as a party to any contract entered into by Respondent or Respondent's employees, agents, contractors or consultants engaged to carry out the requirements of this NOV/AO.

EFFECTIVE DATE AND APPLICABILITY

52. **The NOV/AO shall take effect within ten days of receipt.** The AO shall apply to Respondent, its officers, agents, servants, employees, successors and assigns, and to all persons, firms and corporations acting under, through or for Respondent. This action is not subject to Office of Management and Budget review under the Paperwork Reduction Act, 44 U.S.C. Chapter 35.

53. If Respondent has any questions regarding this NOV/AO, please contact Len Wallace at (617) 918-1835, or have your legal counsel contact Laura Berry, Enforcement Counsel, at (617) 918-1148. You are free to seek counsel from an attorney regarding your response. Respondent may seek federal judicial review of the AO pursuant to Section 307(b)(1) of the Clean Air Act, 42 U.S.C. § 7607(b)(1). Respondent may also request an opportunity to confer with EPA in person or by telephone about this NOV/AO by contacting Len Wallace or Laura Berry at the phone numbers listed above within five (5) days of receiving this NOV/AO.

Susan Studlien, Director
Office of Environmental Stewardship
U.S. Environmental Protection Agency
Region 1 – New England

9-19-16
Date

ATTACHMENT 1

Attachment 1

Notice of Violations

EPA inspectors and their contractors found several dangerous conditions at the Facility, listed in the table below, that give rise to violations of the General Duty Clause. Many of these conditions indicate that the Facility is not following industry standards of care that are common in the ammonia refrigeration industry.

In addition to older standards of care, the chart includes references to the 2014 version of International Institute of Ammonia Refrigeration's Standard 2 to ensure that any new work on the refrigeration system is consistent with the latest industry standards. EPA's inspection report for the April 6, 2016 inspection includes some additional historical standards of care that are not included in this chart.

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
Lack of a hazard analysis that identifies hazards posed by the System.	Failure to identify hazards which may result from accidental releases of extremely hazardous substances, using appropriate hazard assessment techniques	Increases likelihood that a dangerous situation will not be recognized in time to prevent a release. Increases likelihood any response to such a release will be less efficient and effective because the scenario was unanticipated and the response unplanned. Increased risk to emergency responders and increased potential for off-site impact.	The recommended industry practice and standard of care for ammonia refrigeration systems of this size would be to identify hazards using industry checklists, a What-if analysis, or a Hazard and Operability study. See e.g., the International Institute of Ammonia Refrigeration's ("IIAR's") *Ammonia Refrigeration Management Program* (2005), Section 10; EPA's *Guidance for Implementation of the General Duty Clause Clean Air Act Section 112(r)(1)*, available at http://www.epa.gov/oem/docs/chem/gdcregionalguidance.pdf; and IIAR Bulletin No. 110, *Start-up, Inspection and Maintenance of Ammonia Mechanical Refrigerating Systems* (1993, rev. 2002) Section 5.2.1 [The owner shall confirm that a Process Hazard Analysis has been completed and that recommendations have been resolved or implemented.]

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
Inadequate documentation available about the technology and equipment in the process. For example, the Piping and Instrumentation Diagram posted in the Ammonia Machinery Room did not include some of the key equipment present in that room. Nor did the facility have pressure relief vent calculations to verify that the vent header was appropriately sized. Also there were missing "U' or "UM" stamps, nameplates, or National Board numbers on various pressure vessels (or other information about those vessels)	Failure to identify hazards which may result from accidental releases, using appropriate hazard assessment techniques. Failure to design and maintain a safe facility taking such steps as are necessary to prevent releases.	These documents provide operators and inspectors with essential understanding of the functioning and capacity of the system and the risks that the system poses. They are also essential in ensuring the proper maintenance of the system. Releases are more likely, and their consequences more severe, when there is limited information available for hazard identification and minimization.	IIAR Bulletin No. 109 (1997), *Minimum Safety Criteria for a Safe Ammonia Refrigeration System*, [Safety Inspection Checklists]; Section 4.3.1.2 (specifying name plate requirements for pressure vessels) IIAR Bulletin No. 110, *Start-up, Inspection and Maintenance of Ammonia Mechanical Refrigerating Systems*, Section 4 [Records]; Section 6.4 [testing/information requirements to demonstrate that pressure vessels are fit for service] IIAR's *Ammonia Refrigeration Manual*, Section 3, including MSDS sheets, documentation of ammonia inventory at facility (e.g., documentation of ammonia charges, ammonia inventory during pump-out conditions, or detailed pipe-by-pipe/vessel-by-vessel inventory calculations); refrigeration flow diagrams; facility plan view (for use with fire department); equipment list for ammonia refrigeration equipment with detailed information about the equipment; desired system operating ranges (document desired system operating ranges for pressure, levels, and temperatures in the system); information re. safety systems (e.g., alarms, compressor cut-outs, and ammonia detection systems); relief system design; ventilation system capacity; installation, operation, and maintenance manuals; and manufacturers data reports for all pressure vessels) ANSI/IIAR 2-2014, Sections 15.3.7 (specifying that pressure relief devices shall have sufficient mass flow carrying capacity to limit the pressure rise in protected equipment to prevent catastrophic failure and setting out how to determine capacity of pressure relief devices for several different types of vessels including pressure vessels, oil separators, plate heat exchangers, shell and tube heat exchangers, product storage tanks); 15.5 (specifying how and where ammonia should be discharged through pressure relief devices – generally to the atmosphere with some exceptions, and how to calculate length of discharge pipe); 12.2.2 (specifying that pressure vessels exceeding 6 inches inside diameter must comply with the ASME Boiler and Pressure Vessel Code, Section VIII Division 1); 12.4.1 (specifying information that must be on pressure vessel nameplates, including manufacturer's name, max. allowable working pressure information, minimum design metal temperature information, manufacturer's serial number, year of

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
to show that they were fit for service.			manufacture, manufacturer's model number where applicable, and a stamp affixed to the equipment with the minimum design metal temperature that the equipment is operated at in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Div. 1); 5.14.4 (Requiring that equipment shall have a nameplate with minimum data that describes or defines the manufacturer's information and design limits and purpose as specified in Chapter 8 through Chapter 16, specifications regarding how the nameplates shall be affixed, and requirements for duplicate nameplates). ANSI/IIAR 2-2008, Sections 9.3 (nameplate requirements for pressure vessels); 11.2.7 (specifying the required discharge capacity of a pressure relief device); and 11.3 ("The size of the discharge pipe from a pressure-relief device shall not be less than the outlet size of the pressure-relief device. The size and maximum equivalent length of common discharge piping downstream from each of two or more relief devices shall be governed by the sum of the discharge capacities of all the relief devices that are expected to discharge simultaneously, at the lowest pressure setting of any relief devices that discharging into the piping, with due allowance for the pressure drop in all downstream sections.") ANSI/ASHRAE 15-2013, Sections 9.7.5 (specifying minimum discharge capacities of pressure-relief device or fusible plugs for each pressure vessel), 9.7.6 (specifying how to determine the rated discharge capacity of a pressure relief device and specifying that all pipe and fittings between the pressure-relief valve and the parts of the system it protects shall have at least the area of the pressure-relief valve inlet area); 9.7.7 (formulas for determining rated discharge capacity); 9.3.2 (Pressure vessels having an inside diameter exceeding 6 inches and having an internal or external design pressure greater than 16 psig shall be directly marked, or marked on a nameplate, with a "U" or "UM" symbol signifying compliance with the rules of Section VIII of the AME Boiler and Pressure Code.); 9.4 (pressure relief protection) National Board Inspection Code Part 2 – Inspection (regarding procedures to follow when nameplates are missing)

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
Five of the oil separator pressure vessels are not protected by pressure-relief devices to safely relieve pressure buildup that could occur during fires or abnormal conditions	Failure to design and maintain a safe facility taking such steps as are necessary to prevent releases.	Failure to have pressure relief devices on pressure vessels can lead to catastrophic failure during fire or abnormal conditions, releasing ammonia.	ANSI/IIAR 2-2008, Section 11.2.1 ("Pressure vessels shall be provided with pressure relief protection in accordance with rules given in the governing edition of Section VIII, Division 1, ASME Boiler and Pressure Vessel Code."); 11.2.2 ("Pressure vessels containing liquid refrigerant that are capable of being isolated by stop valves from other parts of a closed-circuit ammonia refrigerating system shall be provided with overpressure protection." ANSI/IIAR 2-2014, Sections 15.3.1 (requiring pressure vessels and other types of equipment built and stamped in accordance with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 to be provided with certified pressure relief protection.) ANSI/ASHRAE 15-2013, Section 9.4 (requiring pressure vessels to be protected with overpressure protection) IIAR Bulletin 109, Section 4.9.1 ("Single or dual safety pressure relief valves or other suitable relief devices shall be provided on all vessels, heat exchangers, oil pots, oil stills and elsewhere on the ammonia refrigerating system....") IIAR Bulletin 110 (1993), Section 6.8 ["In all instances, the removal of oil must be done very carefully. You must remember liquid ammonia can be present behind the oil, or that there may not be oil present, only liquid ammonia. The oil drain valve should be a rapid closing valve."....."A pressure relief valve should be installed on all oil pots."]
Excessive corrosion on refrigeration piping in the Ammonia Machinery Room. Also, on the roof, the inspectors observed several instances of rusted valves and piping around	Failure to design and maintain a safe facility taking such steps as are necessary to prevent releases.	Risks release of ammonia from pipes and/or system components if corrosion continues to point of failure.	The industry standard of care calls for a *preventative* maintenance program. See e.g., IIAR's *Ammonia Refrigeration Manual,* Section 5 and Appendix 5.1; IIAR Bulletin No. 110, *Startup, Inspection and Maintenance of Ammonia Mechanical Refrigerating Systems,* Section 4.3 [regarding inspection of equipment after being out of use for, among other things, corrosion]; Section 6.6 [Inspection and Maintenance – Valves and Sensing Devices] and Section 6.7 [Inspection and Maintenance – Piping]. IIAR Bulletin No. 109, *IIAR Minimum Safety Criteria for a Safe Ammonia Refrigeration System,* Sections 4.7.4 and 4.7.5 and inspection checklists [4.7.4 –Uninsulated refrigerant piping should be examined for signs of corrosion. If corrosion exists, the pipe should be cleaned down to bare metal and painted with a rust prevention paint. Badly corroded

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
uninsulated valve manifolds.			pipe should be replaced.] [4.7.5 –Insulated piping showing signs of vapor barrier failure should have the insulation removed and the pipe inspected....]; [Inspection checklists have corrosion monitoring question for pressure vessels, heat exchangers, evaporators, condensers, and piping.] FM Global Property Loss Prevention Data Sheet 12-61 *Mechanical Refrigeration*, Section 2.2.1.2 [Piping, heat exchangers and other system pressure vessels should be well supported and protected against mechanical and corrosion damage.] Section 53.3.1.1 of NFPA 1 (2012 ed.)[1] [Refrigeration systems shall be operated and maintained in a safe and operable condition, free from accumulations of oil, dirt, waste, excessive corrosion, other debris or leaks, and in accordance with ASHRAE 15 and the mechanical code.] IMC 2009, Section 1101.7 [Mechanical refrigeration systems shall be maintained in proper operating condition, free from accumulations of oil, dirt, waste, excessive corrosion, other debris and leaks.] ANSI/IIAR 2-2014, Section 13.4.2 [requiring refrigerant piping to be isolated and supported to prevent damage from vibration, stress, corrosion, and physical impact]
Damaged, stained, and missing insulation in multiple areas on ammonia piping and vessels in the Ammonia Machinery Room, roof and in other	Failure to design and maintain a safe facility taking such steps as are necessary to prevent releases.	Vapor barriers protect pipes and vessels from moisture, which causes corrosion. Corroded pipes and vessels can break or succumb to pressure, causing an ammonia release.	IIAR Bulletin No. 109, *IIAR Minimum Safety Criteria for a Safe Ammonia Refrigeration System*, Section 4.7.5 [Insulated piping showing signs of vapor barrier failure should have the insulation removed and the pipe inspected....] IIAR Bulletin 110 – 6.7.2 [Insulated Piping: Any mechanical damage to insulation should be repaired immediately and the vapor seal reinstated to prevent access of water or water vapor which will lead to breakdown of insulation and corrosion of the pipework.]; 6.4.3 [Annual Inspection: "In the case of pressure vessels and heat exchangers covered by insulation, any effects of dampness or deterioration of the insulation which could lead to the eventual corrosion of the vessel or its connections shall be investigated. Surface

[1] See 53.5.1 and 53.5.3 of NFPA 1 (2003 and 2006 edition). Citations in the 2012 edition changed considerably from earlier versions.

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
areas containing ammonia piping. In addition, on the loading dock, the inspectors observed a section of ammonia piping wrapped in a type of insulation that retains moisture and liquid between the insulation and piping, increasing the likelihood of corrosion.			treatment shall be applied to the vessels if required and the insulation shall be repaired within the shortest time."] ANSI/IIAR 2-2014, Section 5.10.1 [piping and equipment surfaces not intended for heat exchange shall be insulated, treated, or otherwise protected to mitigate condensation and excessive frost buildup]; See also Section 6.6.1 [piping and fittings shall be insulated as required by Section 5.10]
Faulty Ventilation: The Ammonia Machinery Room's mechanical air intake louvers do not appear to be of the type that use power to close and otherwise spring open automatically; the louvers did not open during the Release; and the motor and louvers were not properly	Failure to design and maintain a safe facility taking such steps as are necessary to prevent releases. Failure to minimize the consequences of releases which do occur.	Without adequate ventilation, vapors are more likely to build up to levels that are significant inhalation and dermal hazards or that risk causing fire or explosion. Also, where an exterior emergency ventilation on-switch is lacking or not functioning, the buildup of dangerous levels of toxic/flammable vapors in a machinery room can delay the entry of emergency response personnel to shut off the system, resulting in a prolonged release.	ANSI/ASHRAE 15-2013, *Safety Standard for Refrigeration System,* Section 8.11.4 ["Mechanical ventilation referred to in Section 8.11.3 shall be by one or more power-driven fans capable of exhausting air from the machinery room at least in the amount given in the formula in Section 8.11.5. Provision shall be made for inlet air to replace that being exhausted. Openings for inlet air shall be positioned to avoid recirculation..."] ANSI/IIAR 2-2008 (2012 ed.), *Equipment, Design, and Installation of Closed-Circuit Ammonia Mechanical Refrigerating Systems,* Section 13.3.3.4 [If motorized dampers are utilized, they shall be of the power to close and spring to open type.]; Section 13.3.8.1 [Normal mechanical ventilation design capacity shall be the greater of (a) 20 Air Changes per hour (20 ACH) based on the total gross volume of the machinery room, (b) The volume required to limit the room temperature to 104°F (40°C) taking into account the ambient heating effect of all machinery in the room and with the ventilation air entering the room at a 1% ASHRAE design....]; Section 13.3.9.1 [Emergency mechanical ventilation systems shall be capable of providing at least one air change every two minutes, which is 30 air changes per hour (30 ACH) based on the gross machinery room volume.] Section

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
assembled together. During the first inspection, the emergency ventilation was turned on, but the louvers did not open. They also were in the closed position when power to that room was turned completely off.			13.3.9.2 [Emergency mechanical ventilation shall be actuated by (a) A refrigerant detector at a level not exceeding 1,000 ppm; (b) Manual controls.] ANSI/IIAR 2-2014, Section 6.14.5 (Inlet Air), specifically 6.14.5.1 [Outside air shall be provided to replace air being exhausted and shall maintain negative pressure in the machinery room]; Section 6.14.5.5 [Intakes for makeup air to the machinery room shall serve only the machinery room.]; Section 6.14.5.6 [Motorized louvers or dampers, where utilized, shall fail to the open position upon loss of power.]; Section 6.14.7.2 [Emergency mechanical ventilation shall be activated by both an ammonia leak detection and a manual control switch.]; App. K [alternative ventilation calculation methods]; Also see Section 53.2.3.3 of NFPA 1 (2012 ed.) [re. ventilation systems][2] IMC 2009, Sections 1105.6 [Machinery rooms shall be mechanically ventilated to the outdoors. Mechanical ventilation shall be capable of exhausting the minimum quantity of air (as further required by this section) both at normal operating and emergency conditions], 1105.4 [Periodic tests of the mechanical ventilating system shall be performed in accordance with manufacturer's specifications and as required by the code official.], and 1106.5.2 [A clearly identified switch of the break-glass type shall provide on-only control of the machinery room ventilation fans.].
Lack of functioning audio/visual alarms: There were no visual and audible alarms in the Ammonia Machinery Room. Nor were there audio/visual alarms outside other rooms	Failure to design and maintain a safe facility taking such steps as are necessary to prevent releases.	Ammonia detectors and alarms provide early warning that a release is taking place, enabling quick response and protecting workers, emergency responders, and the public from a larger release.	ANSI/IIAR 2-2008 (Add. B, 2012 ed.), *Equipment, Design, and Installation of Closed-Circuit Ammonia Mechanical Refrigerating Systems*, Section 13.2 [Each refrigerating machinery room shall contain at least two refrigerant detectors that actuate an alarm and mechanical ventilation.]; Section 13.2.1.2 [The detectors shall activate visual and audible alarms inside the refrigerating machinery room and outside each entrance to the refrigerating machinery room.] ANSI/IIAR 2-2014, Sections 6.13.1 and 17.7 [The machinery room shall have at least one ammonia detector that activates alarm that reports to monitored location at concentration of 25 ppm or higher; audible and visual alarms shall be provided inside

[2] Sections 53.10.4 and 53.10.5 of NFPA 1 (2006 edition).

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
containing ammonia refrigeration equipment and piping. Outside the primary entrance to the Ammonia Machinery Room was an inadequately labeled visual alarm, but no audio alarm was present. There were no audio or visual alarms near the second-floor doors of the Ammonia Machinery Room should someone attempt to enter the room from the outside (e.g., by ladder or fire truck). Moreover, the M&M system printout indicated that, although the vapor detector in the Ammonia Machinery Room was functioning to detect	Failure to minimize the consequences of releases which do occur.		machinery room to warn that access restricted to authorized personnel and emergency responders when alarm activated; additional audible and visual alarms shall be located outside each entrance to machinery room]; 6.13.2.3 [Detection of ammonia equal to or exceeding 150 ppm shall activate visual indicators and audible alarm and activate emergency ventilation; emergency ventilation shall continue to operate until manually reset by a switch located in the machinery room]; 6.13.2.4 [Detection of ammonia concentration that exceeds detector's upper detection limit or 40,000 ppm (25% LFL), whichever is lower, shall activate visual indicators and audible alarm and emergency ventilation; ventilation will continue to operate until manually reset; refrigerant compressors, refrigerant pumps, and normally closed automatic refrigerant valves not part of emergency control system will be automatically de-energized]; 7.2.(Requirements for Nonmachinery Room Spaces, specifically 7.2.3 which provides – with key exceptions – that Level 1 detection and alarm shall be provided in accordance with 17.7.1 and that the detection/alarm system shall comply with Chapter 17; 17.4 [detectors shall be mounted in position where ammonia from a leak is expected to accumulate]; 17.7.3 [additional requirement that level 3 alarm shall activate system to close control valves and de-energize refrigerant pumps, nonemergency fans and other motors]; 17.5 [audible alarms shall provide sound pressure level of 15 decibels (dBA) above average ambient sound level and 5 dBA above maximum sound level of the area] ANSI/ASHRAE 15-2013, *Safety Standard for Refrigeration System,* Section 8.11.2.1 [Each refrigerating machinery room shall contain a detector located in an area where refrigerant from a leak will concentrate that activates an alarm and mechanical ventilation....The alarm shall annunciate visual and audible alarms inside the refrigerating machinery room and outside each entrance to the refrigerating machinery room.] NFPA 1 (2012 ed.) Section 53.2.3.1 [requirement for vapor detectors, monitors and alarm system]; Section 8.12.h [When ammonia is used, the machinery room is not required to meet Class 1, Division 2 of the National Electric Code provided (a) the mechanical ventilation system in the machinery room is run continuously and failure of the mechanical ventilation system actuates an alarm or (b) the machinery room is equipped

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
levels of ammonia during the March 23 incident, the safety interlocks between this detector and the alarm/system shutdown had been disabled prior to the Release. (The interlock between this detector, the ventilation system, and the compressors also was disabled.)			with a detector, conforming to Section 8.11.2.1, except the detector shall alarm at 1000 ppm.] IIAR's Ammonia Refrigeration Manual (2005), Appendix A, item 9.2 at A10-36
Hansen ammonia detectors in the machinery room, cooler rooms, freezer room, and loading dock near the ceiling had not been calibrated since January 2015, and no record of bump tests was provided.	Failure to design and maintain a safe facility taking such steps as are necessary to prevent releases. Failure to minimize the consequences of releases which do occur.	Properly functioning ammonia detectors provide early warning that a release is taking place, enabling quick response and protecting workers, emergency responders, and the public from a larger release.	Hansen Bulletin A100 (Feb. 2008), indicating that bump tests should be completed at least once every six months and calibration of the sensors should be completed annually at a minimum. ANSI/IIAR 2-2014, Section 17.3 (Testing requirements for ammonia detection and alarms, specifying that a schedule for testing shall be established based on manufacturer's recommendations unless modified based on documented experience. Where manufacturer's recommendations are not provided, they shall be tested at least annually.) IIAR Bulletin 110, Section 6.6.4 (Specifies that manufacturer's instructions should be followed for inspecting, testing, calibrating and overhauling the following equipment: sensing devices, monitoring devices, sensors, alarms, interlocks, and emergency shutdown systems). ANSI/ASHRAE 15-2013, *Safety Standard for Refrigeration System,* Section 11.6.3 ["Detector(s), alarm(s) and mechanical ventilating systems shall be tested in accordance

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
			manufacturers' specifications and the requirements of the jurisdiction having authority."] NFPA 1 (2012 ed.) Sections 53.2.3.1.7, 53.3.2.2, 53.3.2.3 and 53.3.2.4
Problems with remote controls for activating ventilation and shutting down refrigeration equipment: There was a remote emergency shutdown control and ventilation switch outside the machinery room door, but these controls lacked clear signage about their function and were not easily accessible to emergency responders, due to a missing key. Moreover, the existing remote controls would have been difficult for a person working in the machinery room	Failure to design and maintain a safe facility taking such steps as are necessary to prevent releases. Failure to minimize the consequences of releases which do occur.	Creates risk of harm to workers and emergency responders who cannot quickly shut down or properly ventilate machinery room without entering the room, which could contain dangerous levels of vapors. The delay could also contribute to a longer ammonia release time, increasing risks to workers, emergency responders, and people off-site.	ANSI/ASHRAE 15-2013, *Safety Standard for Refrigeration Systems,* Section 8.12.1 [Remote control of the mechanical equipment in the refrigerating machinery room shall be provided immediately outside the machinery room door solely for the purpose of shutting down the equipment in an emergency. Ventilation fans shall be on a separate electrical circuit and have a control switch located immediately outside the machinery room door.] ANSI/IIAR 2-2008 (Add. B, 2012 ed.), *Equipment, Design, and Installation of Closed-Circuit Ammonia Mechanical Refrigerating Systems,* Section 13.1.13.2 [A remote emergency shutdown control for refrigerant compressors, refrigerant pumps, and normally closed automatic refrigerant valves within the machinery room, shall be provided immediately outside the designated principle exterior machinery room door...]; Section 13.3.1 [....The mechanical ventilation systems shall be powered independently of the machine room machinery and shall not be subject to emergency shutdown controls.].; Section 13.3.11 [Ventilation Remote Controls, specifically 13.3.11.1 which specifies that emergency remote controls for the emergency mechanical ventilation systems shall be provided and be located immediately outside the designated principle exterior machinery room door; 13.3.11.2 which specifies that the function of the emergency remote controls shall be clearly marked by signage near the controls; 13.3.11.3 which specifies that there must be an "on/auto" override for emergency ventilation immediately outside the designated principle exterior machinery room door; and 13.3.11.4 which states that there should be a "on/off/auto" override for normal and emergency ventilation at a secured remote location."] ANSI/IIAR 2-2014, Section 15.15 [Directions for emergency shutdown should be provided at a location readily accessible to trained refrigeration system staff and trained emergency responders; schematic drawings or signage should include details/steps for shutting down the system in an emergency; contact names and telephone numbers for

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
to access in an emergency, given that the machinery room was upstairs from the remote controls, with no separate door or remote controls upstairs. Also, the emergency ventilation system was not working on the day of EPA's March 24 inspection; the emergency ventilation was turned on but the air intake louvers were closed. Finally, the emergency shut-off switch did not turn off all electrical power to the machinery room, risking ignition of ammonia vapors during a release; an			refrigeration system operating, maintenance and management staff, emergency responders, and safety personnel; contact names and telephone numbers of corporate, local, state and federal agencies to be contacted in event of reportable incident; quantity of ammonia in the system, type and quantity of refrigerant in system; and the field test pressures applied]; Section 6.12.1 [Emergency Stop Switch. A clearly identified emergency shut-off switch with a tamper resistant cover shall be located outside and adjacent to the designated principal machinery room door. The switch shall provide off-only control of refrigerant compressors, refrigerant pumps, and normally closed automatic refrigerant valves located in the machinery room. The function of the switch shall be clearly marked by signage near the controls.]; 6.12.2 [Emergency Ventilation Control Switch. A clearly identified control switch for emergency ventilation with a tamper-resistant cover shall be located outside the machinery room and adjacent to primary machinery room door. The switch shall provide "ON/AUTO" override capability for emergency ventilation. The function of the switch shall be clearly marked by signage near the controls.]; Section 6.14.7.3 [Emergency ventilation shall be powered independently of machine room equipment and continue to operate regardless of whether emergency shutdown controls have been activated.] NFPA 1 (2012 ed.) Section 53.2.3.1.4 [emergency shut-off interface requirements, requiring vapor detectors to automatically turn off electrical power at concentrations at or above 25% of LFL]; 53.2.3.3.1 [requiring emergency ventilation switch right outside machinery room door].[3] Also, see Sections 53.2.3.4.5 (shutoffs for refrigeration machinery) and 53.2.3.3.1 (ventilation switch).

[3] Sections 53.11, 53.10.2, 53.10.9, and 5.10.5 of NFPA-1 2006 edition.

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
air compressor (which was not part of the refrigeration system) came on during the March 24 inspection, even though the emergency shut-off for the refrigeration system compressors was activated.			
The Ammonia Machinery Room pressure relief vent line is located less than 7.5 feet above the Cooler Room B roof level. All of the high pressure relief vent lines and the emergency exhaust fan discharged less than 20 feet from the property line.	Failure to minimize releases that do occur	Improperly placed discharge reliefs and exhaust fans can result in ammonia being sprayed on people during a release, further exacerbating the consequences of a release.	ANSI/IIAR 2-2008 (Add. B., 2012 ed.), Sections 11.3.6.3 [requirement for pressure relief to discharge at least 20 feet from window, ventilation intake or personnel exit] and 11.3.6.4 [requirement to discharge to atmosphere at least 15 feet above adjacent roof level] ANSI/IIAR 2-2014, Section 15.5 [pressure relief device discharge piping must discharge at least: 7.25 feet above the roof, adjacent roof line or platform surface; 15 feet above grade and at least 20 feet from windows, ventilation intakes, or exits, and discharge shall be directed upward and arranged to avoid spraying ammonia on persons in the vicinity]; 6.14.3.4 [Machinery room exhaust shall vent to the outdoors no fewer than 20 feet from a property line or openings into the buildings.] ANSI/ASHRAE 15 (2013) Section 9.7.8 [Requires discharge to atmosphere 15 feet above adjoining ground level and not less than 20 feet from window, ventilation opening, or exit. Discharge shall terminate in a manner that will prevent discharged refrigerant from being sprayed on people.]; NFPA 1 (2012 ed.) Section 53.2.2.1.2 (15 feet discharge to atmosphere requirement plus some other discharge options for ammonia flaring and diffusion systems].[4] See also,

[4] Section 53.8.3.2 of NFPA 1-2006 edition.

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
			Section 53.2.3.3.12 (exhaust must discharge at least 20 feet from the property line or openings into the building) IMC 2009, Sections 1105.7 [Pressure relief devices, fusible plugs and purge systems located within the machinery room shall terminate outside of the structure at a location not less than 15 feet above the adjoining grade level and not less than 20 feet from any window, ventilation opening or exit]; 1105.6.1 [Exhaust from mechanical ventilation systems shall be discharged not less than 20 feet from a property line or openings into buildings.]

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
Fire Hazards: Open electrical junction boxes, loose wiring, and light sockets without bulbs were present in the Maintenance Room and in the Ammonia Machinery Room. The electrical switchgear room inside of the expansion Ammonia Machinery Room contained an electrical conduit that was dripping water from a fitting, indicating that water was present inside the conduit and	Failure to design and maintain a safe facility taking such steps as are necessary to prevent releases. Failure to minimize the consequences of releases which do occur.	Exacerbates risk of fire or explosion. Ammonia is flammable at certain concentrations.	ANSI/IIAR 2-2008 (Add. B., 2012 ed.), *Equipment, Design, and Installation of Closed-Circuit Ammonia Mechanical Refrigerating Systems*, Section 13.1.3.1 [Flammable and combustible materials shall not be stored in machinery rooms.]; Section 13.1.7 Electrical Safety [requires wiring to be installed in accordance with the National Electrical Code]; NFPA 1 (2012 ed.), Section 53.3.1.3.1 [Flammable and combustible materials shall not be stored in the refrigeration machinery rooms except for incidental materials necessary for the safe and proper operation and maintenance of the system.][5]; 53.2.3.4 and 11.1 [electrical equipment and electrical installations in refrigeration machinery room shall comply with Section 11.1] IIAR Bulletin 109 *Minimum Safety Criteria for a Safe Refrigeration System*, General Safety checklist, item (x) [Covers should be fastened to all electrical panels and junction boxes.] 29 C.F.R. § 1910.303(g)(2) (guarding of live parts) NFPA 70 (National Electric Code) (2011), Section 110-27 (guarding of live parts)

[5] Section 53.10.7, 53.12, and 53.10.8.2 of NFPA-1 (2006 edition). Note that NFPA 1 (2006 ed.) has different provisions than the 2012 edition for electrical safety, but the restriction on storage of flammable or combustible materials is the same as in the 2012 edition.

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
presenting an electrical hazard. There were also combustible materials in areas that were not separated from the Ammonia Machinery Room (*e.g.*, wooden stairs, flammable items stored on first floor). Heaters on the loading dock, near the evaporator units and ammonia piping, are a potential ignition source and fire hazard in the event of an ammonia release. Not interlocked with ammonia detection system.			
The machinery room door was not adequately labeled to:	Failure to design and maintain a safe facility taking such	Increases the chance of inadvertent exposure to ammonia releases and could frustrate effort to react quickly and properly during an ammonia	ANSI/IIAR 2-2008 (Add. B., 2012 ed.), *Equipment, Design, and Installation of Closed-Circuit Ammonia Mechanical Refrigerating Systems,* Section 13.1.10.4: In section entitled, "Entrances and Exits" is a requirement that refrigerating systems shall be provided with approved informative signs, emergency signs, charts and labels in accordance with NFPA 704. Hazard signs shall be in accordance with International

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
o warn of the hazards of entering a room with ammonia-containing machinery; o restrict access to authorized personnel; o provide appropriate information about alarms; o and provide information about emergency procedures.	steps as are necessary to prevent releases. Failure to minimize the consequences of releases which do occur.	release. Signs and posted information provide a level of protection in addition to worker training and operating procedures.	Mechanical Code. Refers to Appendix L. Also see Section 13.1.2.4 (signs restricting entry to authorized personnel), Section 13.2.4.1 (signs with meaning of alarms near the visual and audible alarms); and Appendix L (examples of recommended machinery room door signage); ANSI/IIAR 2-2014, Sections 6.3.4 and 6.15 [requires that access to machinery room be restricted to authorized personnel and that machinery room doors shall have restricted access, signage, alarm signage and NFPA 704 placards]; Sections 6.15.2 and 17.6 [use of signage to identify ammonia leak detection alarms]; Appendix J [examples of recommended machinery room door signage] ANSI/ASHRAE 15-2013, *Safety Standard for Refrigeration Systems*, Sections 8.11.2.1 (signs with meaning of alarms); 8.11.8 (signs restricting entry to authorized personnel); 11.2.4 (same); 11.7 (posted emergency shutdown procedures); NFPA 704 (re. readability of signs) IIAR's Ammonia Refrigeration Manual (2005), Appendix A, item 11.3 at A10-40 ["Is access to the machinery room(s) restricted to authorized personnel?"]
There were no emergency shutdown instructions in any of the documents that were collected from the company or posted on signs.	Failure to design and maintain a safe facility taking such steps as are necessary to prevent releases. Failure to minimize the	Increases the chance of exposure to ammonia releases and could frustrate effort to react quickly and properly during an ammonia release. Signs and posted information provide a level of protection in addition to worker training and operating procedures. Proper emergency procedures can also prevent larger releases.	IIAR Bulletin 109, Section 4.10.5 [A sign or signs should be posted in a conspicuous location providing emergency instructions and phone numbers of emergency safety and operating personnel.] ANSI/AHSRAE 15-2013, Section 11.7 [Responsibility for Operation and Emergency Shutdown: .....Emergency shutdown procedures, including precautions to be observed in case of a breakdown or leak, shall be displayed on a conspicuous card located as near as possible to the refrigerant compressor. These precautions shall address a. instructions for shutting down the system in case of an emergency; b. the name, address, and day and night telephone numbers for obtaining service; c. the names, addresses and telephone numbers of all corporate, local, state, and federal agencies to be contacted in the event of a reportable incident. When a refrigerating machinery room is used, the

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
	consequences of releases which do occur.		emergency procedures shall be posted outside the room, immediately adjacent to each door. The emergency procedures shall forbid entry into the refrigerating machinery room when the refrigerant alarm required by Section 8.11.2.1 has been activated except by persons provided with the appropriate respiratory and other protective equipment and trained in accordance with jurisdictional requirements.] ANSI/IIAR 2-2014, Section 5.15 [Emergency Shutdown Documentation. It shall be the duty of the person in charge of the premises at which the refrigeration system is installed to provide directions for the emergency shutdown of the system at a location that is readily accessible to trained refrigeration system staff and trained emergency responders. Schematic drawings or signage shall include the following: 1. Instructions with details and steps for shutting down the system in an emergency. 2. The name and telephone numbers of the refrigeration operating, maintenance, and management staff, emergency responders, and safety personnel. 3. The names and telephone numbers of all corporate, local, state, and federal agencies to be contacted as required in the event of a reportable incident. 4. Quantity of ammonia in the system. 5. Type of ammonia in the system. 5. Type and quantity of refrigerant oil in the system. 6. Field Pressures applied.] IIAR's *Ammonia Refrigeration Manual*, Section 4.2, recommending that emergency shutdown procedures be written.
Failure to have a legible, permanent sign securely attached and easily accessible in any location on the ammonia refrigeration system displaying the	Failure to design and maintain a safe facility	Information provides critical information to those who are maintaining system.	IIAR Bulletin 109, Section 4.10.4 IIAR Bulletin 109, general safety checklist item (i) ANSI/ASHRAE 15-2013, Section 11.2.1 NFPA 1-2012, Section 53.2.4.1 (signage requirements include most, but not all, of the required information listed in column 1 of this table)[6]

[6] Section 53.14 in NFPA 1 (2006 ed.)

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
following information: a) Name and address of the installer b) The refrigerant number and the amount of refrigerant in the system c) The lubricant identity and amount d) The field test pressure(s) applied			ANSI/IIAR 2-2014, Section 5.15 [among other emergency shutdown schematic drawings or signage, must have info. on quantity of ammonia in system, type and quantity of refrigerant oil in the system, and field test pressures applied]
The doors into the ammonia machinery room on the first and second floors were not tight-fitting and self-closing.	Failure to minimize the consequences of releases which do occur.	In the event of an ammonia release inside the machinery room, the failure to have a tight-fitting and self-closing door risks the spread of ammonia vapors outside the room. Also, it is more difficult for employees to escape the room when the door opens into the room rather than out.	ANSI/IIAR 2-2008 (Add. B., 2012 ed.), *Equipment, Design, and Installation of Closed-Circuit Ammonia Mechanical Refrigerating Systems*, Section 13.1.10.1 [Each refrigerating machinery room shall have a tight-fitting door or doors opening outward, self-closing if they open into the building, and adequate in number to ensure freedom for persons to escape in an emergency.] 13.1.10.3 [The refrigerating machinery room shall have a door that opens directly to the outside air or through a vestibule equipped with self-closing, tight-fitting doors equipped with panic-type hardware.] ANSI/IIAR 2-2014, Sections 6.10.1 [Machinery rooms exceeding 1,000 ft^2 must have at least two exit or exit-access doors, one of which can be served by a fixed ladder or alternating tread device, and all portions of a machinery room shall be within 150 ft of an exit]; and 6.10.2 [machinery doors shall be self-closing and tight fitting; doors that are part of the means of egress shall be equipped with panic hardware and side hinged to swing in the direction of egress; if machinery room does not have fire sprinklers then doors communicating with the building shall be one-hour fire rated; doors to outdoors shall be fire rated where required by the Building Code based on fire rating for exterior wall openings]. ANSI/ASHRAE 15-2013, *Safety Standard for Refrigeration System*, Section 8.12.d. [The refrigerating machinery room shall have a door that opens directly to the outdoors or

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
			through a vestibule equipped with self-closing, tight-fitting doors.]; 8.11.2 [Each refrigeration machinery room door shall have a tight-fitting door or doors opening outward, self-closing if they open to the building and adequate in number to ensure freedom for persons to escape in an emergency. With the exception of access doors and panels in air ducts and air handling units...there shall be no openings that will permit passage of escaping refrigerant to other parts of the building.]; Section 8.12.b [Doors communicating with the building shall be approved, self-closing, tight-fitting doors.] IIAR's *Ammonia Refrigeration Manual*, Appendix A, item 11.14-11.18 at A10-42 [including questions about whether the doors are tight-fitting, open outward, and fitted with panic-type hardware; whether there are enough doors to ensure freedom to escape; and whether single exits are clear of any ammonia piping equipment or other obstructions]
The machinery room walls contained holes and gaps for piping and conduit that were not sealed from other spaces in the building.	Failure to minimize the consequences of releases which do occur.	Allows release of ammonia inside the machinery room to spread to other parts of the building, putting employees and responders at risk.	ANSI/ASHRAE-15(2013), Sections 8.11.2 [...With the exception of access doors and panels in air ducts and air handling units...there shall be no openings that will permit passage of escaping refrigerant to other parts of the building.]; 8.11.7 [there shall be no air flow to or from an occupied space through a machinery room unless the air is ducted and sealed in a manner to prevent any refrigerant leakage from entering the airstream]; and 8.12(f) [All pipes piercing the interior walls, ceiling, or floor of such rooms shall be tightly sealed to the walls, ceiling, or floors through which they pass.] ANSI/IIAR 2-2008 (Add. B, 2012 ed.), Section 13.1.1.3 [Walls, floor, and ceiling shall be tight and of non-combustible construction – with exception from non-combustible construction requirement for buildings equipped with automatic sprinkler system]; Section 13.1.5.2 [All pipes piercing the interior walls, ceiling, or floor of machinery rooms shall be tightly sealed to the walls, ceiling, or floors through which they pass.] ANSI/IIAR 2-2014, Section 6.6.2 [Pipes penetrating the machinery room separation shall be sealed to the walls, ceiling, or floor through which they pass]; 6.2.5 Airflow from Occupied Spaces. Air shall not flow to or from any portion of a premises that is routinely accessible to or occupied by people on a part time or full-time basis through a machinery room unless the air is ducted and sealed to prevent ammonia leakage from entering the

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
			airstream. Access doors and panels in ductwork and air handling units located in a machinery room shall be gasketed and tight-fitting.] IIAR's *Ammonia Refrigeration Manual*, Appendix A, item 11.28 [Are all pipes piercing the exterior walls, ceiling or floor of the machinery room(s) tightly sealed....?]
The inspectors observed a significant amount of piping and equipment in the Ammonia Machinery Room, roof, and other ammonia-containing areas that was inadequately labeled or missing labeling indicating contents, physical state, and direction of flow. For example, the accumulators in the Ammonia Machinery Room were inadequately labeled.	Failure to design and maintain a safe facility taking such steps as are necessary to prevent releases. Failure to minimize the consequences of releases which do occur.	Makes it more difficult to: properly maintain system, operate correct valves, warn workers and emergency responders about hazards posed by system, reduce risk of human error in operating the system, and respond quickly in the event of a release. The risk was exacerbated at this facility by the co-location of some unmarked natural gas lines, some of which were confusingly painted the same color as the ammonia pipes.	IIAR Bulletin No. 109, *IIAR Minimum Safety Criteria for a Safe Ammonia Refrigeration System*, Section 4.7.6 [All ammonia piping should have appropriate pipe markers attached to indicate the use of the pipe and arrows to indicate the direction of flow, such as in IIAR Bulletin No. 114...]; IIAR Bulletin No. 114, *Identification of Ammonia Refrigeration Piping and System Components*; Sections 4.1 [Piping Markers: Piping markers shall be designed to identify the refrigerant, the physical state of the refrigerant, the relative pressure level of the refrigerant and the direction of flow]; 4.2 [Component Markers: Component markers will bear the name of the equipment they identify, e.g., RECEIVER, ACCUMULATOR, RECIRCULATOR and provide a pressure level designation.]. ANSI/IIAR 2-2008 (Add. B, 2012 ed.), *Equipment, Design, and Installation of Closed-Circuit Ammonia Mechanical Refrigerating Systems*, Section 10.6 [All piping mains, headers and branches shall be identified as to the physical state of the refrigerant (that is, vapor, liquid, etc.), the relative pressure level of the refrigerant, and the direction of flow. The identification system used shall either be one established as a standard by a recognized code or standards body or one described and documented by the facility owner.][7] ANSI/IIAR 2-2014, Sections 5.14.2 [refrigeration machinery shall be provided with labels]; 5.14.3 [emergency shutdown valves shall be clearly and uniquely identified at the valve itself and in the system schematic drawings]; 5.14.5 [ammonia piping mains, headers, and branches shall be identified with the following information: (1) "AMMONIA;" (2) physical state of the ammonia; (3) relative pressure level of ammonia, being low or high as applicable; (4) pipe service (can be abbreviated); and direction of flow. The marking system shall either be one established by a recognized model code or standard or one

[7] This particular requirement was in Section 10.5 of the 2010 edition.

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
			described and documented by facility owner.] ANSI/ASHRAE 15-2013, Section 11.2.2 [Systems containing more than 110 lbs of refrigerant shall be provided with durable signs...designating (a) valves or switches for controlling the refrigerant flow, the ventilation, and the refrigeration compressor(s); and (b) the kind of refrigerant or secondary coolant contained in exposed piping outside the machinery room. Valves or piping adjacent to valves shall be identified in accordance with *ANSI 13.1, Scheme for Identification of Piping Systems*.] IIAR's *Ammonia Refrigeration Manual*, Section 4.2 [Recommends labeling in accordance with Bulletin 114 as part of the facility's Standard Operating Procedure program]; ASME 13.1 (2007), specifying conventions for labeling piping
Main shut-off valves (King Valve) were not identified with a prominent sign.	Failure to design and maintain a safe facility taking such steps as are necessary to prevent releases. Failure to minimize the consequences of releases which do occur.	See above re. labeling of valves. Also, the king valve can be used to quickly shut off flow of ammonia from the ammonia receiver to the rest of the system. Any impediment to its use can lengthen the time of a release, endangering workers, emergency responders, and people off-site.	IIAR Bulletin No. 109, *IIAR Minimum Safety Criteria for a Safe Ammonia Refrigeration System*, Section 4.10.3 [The main shut-off valve(s) (king valve(s)); hot gas defrost line main shut-off valve; and NH_3 pump liquid main shut-off valve(s) and/or disconnects; of the ammonia system should be readily accessible and identified with a prominent sign having letters sufficiently large to be easily read.]; See also General Safety Checklist items (d) and (e). ANSI/ASHRAE 15-2013, *Safety Standard for Refrigeration Systems*, Section 11.2.2 [Systems containing more than 110 lbs of refrigerant shall be provided with durable signs...designating (a) valves or switches for controlling the refrigerant flow, the ventilation, and the refrigeration compressor(s).] ANSI/IIAR 2-2014, Sections 5.14.2 [Refrigeration machinery shall be provided with labels.]; 5.14.3 [Emergency shutdown valves shall be clearly and uniquely identified at the valve itself and in the system schematic drawings.]; NFPA 2-2012 Section 53.2.4.2 [Systems containing more than 110 lbs of refrigerant must have signs for main shutoff to each vessel, electrical controls, remote control valve, pressure limiting device.]

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
The company did not have tags or labelling for pressure relief valves (PRVs) showing date of installation and when they had been last inspected.	Failure to design and maintain a safe facility taking such steps as are necessary to prevent releases.	Makes it very difficult to judge whether valves are still functional. Pressure relief valves should be replaced or recalibrated every five years to ensure that they will function properly. Old pressure relief valves can leak ammonia.	ANSI/ASHRAE-15 (2013), Sections 10.1.1 and 10.2 [testing and declaration of test procedures applicable after complete installation and before operation] IIAR Bulletin 109, Section 4.9.7 [Pressure relief valves discharging to atmosphere should be replaced every five years of service.]; IIAR Bulletin 110 [June 19, 2007 revision of 6.6.3 re. replacement and recalibration of pressure relief valves] National Board Inspection Code Part 2 – Inspection (inspection requirements for pressure relief valves)
Access and Egress to/from Equipment and Room: Failure to provide a clear and unobstructed approach to refrigeration machinery for inspection, service, and emergency shutdown with adequate clearances for maintenance of equipment. For example, the Pilot Receiver pipe that broke in the March 23 release	Failure to design and maintain a safe facility taking such steps as are necessary to prevent releases. Failure to minimize the consequences of releases which do occur.	Makes it very difficult to access machinery for proper preventative maintenance, risking an ammonia release from improperly-maintained equipment. Given the configuration of equipment and lack of support under oil drain pipes, these conditions could also lead to inadvertent breakage of these pipes. Likewise, emergency responders would have a hard time accessing equipment, which could increase the duration of a release. Also, the access/egress deficiencies put workers at risk in the event of an ammonia release.	ANSI/IIAR 2-2008 (Add. B, 2012 ed.), Section 13.1.2.2 [Requires a clear and unobstructed approach and space to refrigeration machinery for inspection, service, and emergency shutdown with adequate clearances for maintenance of equipment.] ANSI/IIAR 2-2014, Sections 6.3.1 [Machinery room equipment shall be located in such a manner as to allow egress from any part of the room in the event of an emergency and provide clearances required for maintenance, operation, and inspection according to manufacturer's instructions.]; 6.3.3.1 [Manually operated valves inaccessible from floor level shall be operable from portable platforms, ladders, or shall be chain operated.]; 6.3.3.2 [Manually operated isolation valves that are part of system emergency shutdown procedure shall be directly operable from floor or chain operated from a permanent work surface.]; 6.11 [Machinery rooms shall be equipped with light fixtures delivering a minimum of 30 foot-candles (320 lumens/m^2) at the working level, 36 in. (0.91 m) above a floor or platform and manual control for illumination sources shall be provided.] ANSI/ASHRAE 15 (2013), Sections 8.3 [A clear and unobstructed approach and space shall be provided for inspection, service and emergency shutdown of condensing units, compressor units, condensers, stop valves, and other serviceable components of refrigerating machinery.], Section 9.12.1 [All serviceable components of refrigerating systems shall be provided with safe access.];

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
was in the way of the oil change point for the accumulator located behind the pilot receiver. Also the Ammonia Machinery Room lacked safe access to the equipment on the roof, because the roof could only be accessed by an unsecured ladder placed precariously near the wooden steps leading downstairs. Also, at least one isolation valve on the Control Pressure receiver was located approximately eight to ten feet above ground level with no permanent platform or ladder or chain for operation to access the valve in the case of an emergency.			IIAR Bulletin 109, Section 4.10.3 [The main shut-off valve(s) should be readily accessible....] and General Safety checklist, item e. IIAR's *Ammonia Refrigeration Manual*, Appendix A, items 7.6 (accessibility of main valves), 11.5 (availability of platforms, ladders or chains for inaccessible valves), 11.33 (lighting) IMC 2009, Section 306.1 [Appliances shall be accessible for inspection, service, repair and replacement without disabling the function of a fire-resistance-rated assembly or removing permanent construction, other appliances, venting systems or any other piping or ducts not connected to the appliance being inspected, serviced, repaired or replaced. A level working space at least 30 inches deep and 30 inches wide shall be provided in front of the control side to service an appliance]

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
Also, the Ammonia Machinery Room was very dark, making it difficult to see, inspect, and move around equipment. Finally, access to and egress from the ammonia machinery room itself was unsafe. The only access and egress was up wooden, combustible stairs, and the upstairs door leading to open air had no steps or adequate protection to prevent someone from falling to the ground.			
There was excessive ice buildup on refrigeration piping, the Control Pressure Receiver, and valves in the Ammonia Machinery Room	Failure to design and maintain a safe facility taking such steps as are necessary to	Ice buildup can obscure valves and weigh down components, risking collapse and ammonia release and making it difficult to turn off components. It also exposes pipes to moisture, which can cause corrosion and pipe failure.	ANSI/IIAR 2-2008 (Add. B, 2012 ed.), Section 10.4.1 [Piping hangars and supports shall carry the weight of the piping, as well as any other anticipated loads. Example: refrigerant weight, insulation, frost/ice, seismic/wind loads, personnel, etc.] ANSI/IIAR 2-2014, Sections 13.4.1 & App. F [Piping hangars shall carry the weight of the piping and any additional expected loads; maximum hangar rod loading tables]; App. A, A.13.4.1 [examples of loads include ammonia weight, insulation, frost, ice, seismic, wind, and thermal]; 5.10.1 [Piping and equipment surfaces not constructed of corrosion-

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
	prevent releases.		resistant materials or protected with corrosion-resistant treatment and not intended for heat exchange shall be insulated, treated, or otherwise protected to mitigate condensation and excessive frost buildup; piping and fittings constructed of corrosion-resistant materials or protected with a corrosion-resistant treatment must be routinely defrosted or otherwise managed to limit ice accumulation if not insulated; if defrost method of ice control used then must provide means to control and drain condensate] IIAR Bulletin 109, Section 4.10.7 [Ice formations that could endanger refrigerant piping or other components should be removed and the condition(s) that caused the ice build-up corrected.]; General safety checklist, item (s) ANSI/ASHRAE 15 (2013), Section 11.6 [Refrigerating systems shall be maintained by the user in a clean condition, free from accumulations of oily dirt, waste, and other debris, and shall be kept accessible at all times.] IIAR Bulletin 110, Section 6.7 [re. piping maintenance]
Failure to safeguard piping, valves, and other system components adequately from accidental damage or rupture by external sources. For example, in the Ammonia Machinery Room, drain lines extending from tanks into walkways were not supported or	Failure to design and maintain a safe facility taking such steps as are necessary to prevent releases.	Risks ammonia release from accidental damage to system components.	ANSI/ASHRAE 15 (2013), Section 11.1 [Means shall be taken to adequately safeguard piping, controls and other refrigeration equipment to minimize possible accidental damage or rupture due to external sources.] ANSI/IIAR 2-2014, Sections 5.17.1 [Guarding or barricading shall be provided for ammonia-containing equipment installed in a location subject to physical damage.]; 13.4.2 [Refrigerant piping shall be isolated and supported to prevent damage from vibration, stress, corrosion, and physical impact.] IIAR Bulletin 109, Section 7 Inspection Checklists for evaporators, item g (adequate protection against traffic hazards?), piping item b Ammonia Refrigeration Manual, Appendix 10.1, item 8.10 [Is all piping protected from traffic hazards such as fork lifts?]

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
protected from physical impact. In Cooler Room A, the inspectors observed pallet racks installed near the ceiling and directly underneath ammonia piping and evaporator units. The inspectors observed a damaged drainage pan under one of the Cooler Room A evaporators, indicating that a forklift or other equipment had run into the pan. The inspectors also observed a low unprotected liquid trap on ammonia piping running above one of the loading dock bays. The temporary refrigeration piping and electrical cords			IMC 2009, Section 1107.2 [Refrigerant piping that crosses an open space that affords passageway in any building shall be not less than 7 feet 3 inches above the floor unless the piping is located against the ceiling of such space.].

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
running across the floor in the loading dock area present a trip hazard for employees working in the area.			
The facility has more than 500 lbs. of anhydrous ammonia and had not submitted 2015 chemical inventory reports to the Boston Fire Department or the Boston Local Emergency Planning Committee. Nor had these reports ever included sulfuric acid or lead.	Failure to minimize releases that do occur. Also an EPCRA violation.	Lack of coordination with fire department and other emergency responders may impede proper emergency response.	40 C.F.R. § 370.10
The facility had a computerized panel to help control the refrigeration system, but it appeared not to be properly calibrated, as it read out the wrong time.	Failure to design and maintain a safe facility taking such steps as are necessary to prevent releases.	This computerized system was intended to provide an extra measure of safety to monitor performance of the system and, in the case of an ammonia leak, turn on ventilation, activate alarms and shut down compressors.	IIAR Bulletin 109, IIAR Minimum Criteria for a Safe Ammonia Refrigeration System, Section 4.10.1 [All installed instruments should be in working order. Inaccurate or broken instruments should be replaced.] IIAR Bulletin No. 110 *Startup, Inspection and Maintenance of Ammonia Mechanical Refrigerating Systems,* Section 6.6.4 Sensing Devices, Monitoring Devices, Sensors, Alarms, Interlocks, and Emergency Shutdown Systems: These devices or systems may take the form of pressure, temperature or level-operated switches or controls, Bourbon tube pressure gauges, or ammonia vapor detectors. It also includes remote level indicators, data collection systems, annunciators, or other automatic devices connected to these other devices. Manufacturer's instructions for inspection, testing, calibration,

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
Also, the interlocks triggered by the ammonia detector had been disabled, such that a detection of high ammonia levels would not automatically turn on ventilation, activate alarms, or shut off machinery.	Failure to minimize the consequences of releases which do occur.		and overhaul shall be followed. At least annually, safety cutouts shall be tested. Pressure gauges used in the testing of any safety cutouts shall be calibrated.]
Lack of proper eyewash and safety showers inside or immediately outside the Maintenance/ Ammonia Machinery Room There was an eyewash station (without a safety shower) at the bottom of the wooden stairs, but it would not have been easily accessible by a worker in the machinery room upstairs. When Mr. Wallace tapped on	Failure to minimize the consequences of releases which do occur.	Makes it difficult for emergency responders and workers to safely respond to releases and wash off this corrosive, toxic chemical in the event of exposure.	ANSI/IIAR 2-2008 (2012 ed.), Equipment, Design, and Installation of Closed-Circuit Ammonia Mechanical Refrigerating Systems, Section 13.1.6 [An eyewash and body shower unit shall be located external to the machinery room and readily accessible via an exit.] ANSI/IIAR 2-2014, Section 6.7 [Eyewash/Safety Shower. 6.7.1 General. Each machinery room shall have access to a minimum of two eyewash/safety shower units, one located inside the machinery room and one located outside of the machinery room, each meeting the requirements in Section 6.7.3. Additional eyewash/safety shower units shall be installed such that the path of travel in the machinery room is no more than 55 ft to an eyewash/safety shower unit. 6.7.2 Path of Travel. The path of travel within the machinery room to at least one eyewash/safety shower unit shall be unobstructed and shall not include intervening doors. 6.7.3 Installation Standard. Emergency eyewash/safety shower unit installations shall comply with ANSI/ISEA Z358.1]

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
the gravity-feed eyewash station during the May 24, 2016 inspection, it sounded hollow (i.e., without much water).			
The floor drains in the Maintenance/ Ammonia Machinery Room did not have means to prevent the entry of spilled materials such as oil and ammonia. The drains are connected with the storm drain system, which may lead to Boston Harbor.	Failure to minimize the consequences of releases which do occur.	The refrigeration system contains both ammonia and oil, so it is foreseeable that both substances could be released into the water, causing environmental damage and exacerbating the negative consequences of any releases that do occur.	ANSI/IIAR 2-2014, Section 6.9 Drains. [6.9.2 Contaminant Control. Where a drainage system is not designed for handling oil, secondary coolants, or other liquids that might be spilled, a means shall be provided to prevent such substances from entering the drainage system. 6.9.3 Control of Ammonia Systems. A means shall be provided to limit the spread of a liquid ammonia spill into the machinery room drainage system.] ANSI/ASHRAE 15-2013, Section 11.3: [....Except for the discharge of pressure relief devices and fusible plugs, incidental releases due to leaks, purging of noncondensables, draining oil, and other routine operating or maintenance procedures, no refrigerant shall be discharged to the atmosphere or to locations such as a sewer, river, stream or lake.] Section 301(a) of the Clean Water Act, 33 U.S.C. § 1311(a), prohibits discharging pollutants through a point source to a water of the United States without a permit.
The windsock observed on the building could not be seen from multiple locations around the facility.	Failure to minimize the consequences of releases which do occur.	Properly placed windsocks help minimize the consequences of releases that do occur by helping emergency responders understand what direction the wind may be carrying toxic ammonia plumes. They can issue shelter-in-place orders or muster evacuees accordingly.	40 C.F.R. § 1910.119 Appendix C – Compliance Guidelines and Recommendations for Process Safety Management (Nonmandatory): [....For outdoor processes where wind direction is important for selecting the safe route to a refuge area, the employer should place a wind direction indicator such as a wind sock or pennant at the highest point that can be seen throughout the process area. Employees can move in the direction of cross wind to upwind to gain safe access to the refuge area by knowing the wind direction...]. ANSI/IIAR 2-2014, Section 5.14.6 [Where a sock, pennant or other wind indicator is provided, it shall be in accordance with specifications and locations prescribed by emergency planning documents.]

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
			IIAR's Ammonia Refrigeration Manual, Appendix 10.1, Hazard Review Checklist, item 11.22 at A10-43 [Is a windsock or some other means of indicating wind direction provided at the facility?]
The Fish Cutting Room is in an enclosed space within Cooler Room A but does not contain an ammonia detector. Because the room is enclosed, the ammonia detector in Cooler Room A near the ceiling in the center of the room would not provide adequate warning of an ammonia release and presents a hazard to employees working in the Cutting room.	Failure to design and maintain a safe facility taking such steps as are necessary to prevent releases. Failure to minimize the consequences of releases which do occur.	Ammonia detectors and alarms provide early warning that a release is taking place, enabling quick response to stop the release and protecting workers, emergency responders, and the public from a larger release.	ANSI/IIAR 2-2014, Section 7.2. [*Requirements for Nonmachinery Room Spaces,* specifically 7.2.3 which provides – with key exceptions – that Level 1 detection and alarm shall be provided in accordance with 17.7.1 and that the detection/alarm system shall comply with Chapter 17]; 17.4 [detectors shall be mounted in position where ammonia from a leak is expected to accumulate]; 17.7.3 [additional requirement that level 3 alarm shall activate system to close control valves and de-energize refrigerant pumps, nonemergency fans and other motors]; 17.5 [audible alarms shall provide sound pressure level of 15 decibels (dBA) above average ambient sound level and 5 dBA above maximum sound level of the area]
The copper water piping around the ammonia feed line to the evaporator in the Fish Cutting Room was oxidized with a bluish-green patina, indicating that ammonia may have	Failure to design and maintain a safe facility taking such steps as are necessary to prevent releases.	Leaking valves or piping could lead to a release of ammonia, endangering employees. Also, a small, slow leak could get worse if not addressed.	IIAR Bulletin 109, Section 4.10.8 [If an ammonia leak is observed, the source of the leak should be investigated and the leak repaired.] IMC 2009, Section 1101.7 [Mechanical refrigeration systems shall be maintained in proper operating condition, free from accumulations of oil, dirt, waste, excessive corrosion, other debris and leaks.]

Dangerous Condition	Potential GDC Violation	How Condition Could Lead to an Accidental Release or Exacerbate Consequences of a Release	Examples of Industry Standards of Care
been leaking from the refrigeration valves or piping at some point in the past.	Failure to minimize the consequences of releases which do occur.		
One of the support legs on an icemaker in Cooler Room B was not bolted to the floor.	Failure to design and maintain a safe facility taking such steps as are necessary to prevent releases.	Adequate supports can prevent ammonia system machinery can prevent detrimental vibration or movement that might make the equipment fail and release ammonia.	IIAR 2-2008 (Add. B) Section 14.4.1 [Supports and foundations shall be adequate to prevent detrimental vibration, movement and any site-specific external loads.]
Inadequate emergency action plan.	Failure to minimize the consequences of releases which do occur.	Can impede a swift, safe emergency response and thus increase risks to workers, emergency responders and people off-site.	IIAR's *Ammonia Refrigeration Management Program* Section 7 (2005): Refrigeration facilities should develop an up-to-date, facility-specific emergency action plan that accurately describes the facility and the potentially affected population. Such a plan should include, among other items: types of evacuation, evacuation procedures and routes, procedures for employees who remain to maintain critical operations, procedures for accounting for evacuated employees, any employee rescue and medical duties, and means for reporting emergencies. An adequate emergency response program should also identify procedures for responding to an ammonia release, including shutting the system down, starting emergency ventilation, and coordinating with all relevant off-site emergency responders. See also EPA's *Guidance for Implementation of the General Duty Clause Clean Air Act Section 112(r)(1),* available at http://www.epa.gov/oem/docs/chem/gdcregionalguidance.pdf